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Euratom Plans Nuclear Breakthrough

THE advent of nuclear power as a major contributor to world energy requirements cannot be forecast with any great accuracy as so much depends upon extrapolation of such curves as are exemplified by fuel costs, industrial activity and growth of population. Such extrapolation, necessary though it may be, is often suspect. In Britain, estimates of the contribution of nuclear power to the nation's fuel requirements, together with the appropriate dates, have been revised a bewildering number of times since the end of the war and currently a deliberate brake is being put on the entire programme. The opposite appears to be true of nuclear power activity within the Community. There is no doubt that the local circumstances of any particular place in the world must determine whether or not nuclear power plant can compete with conventional power stations, but one would have thought that the similarity of conditions in the Community and the U.K. would have given rise to comparable uniformity in the attitude towards industrial nuclear energy.

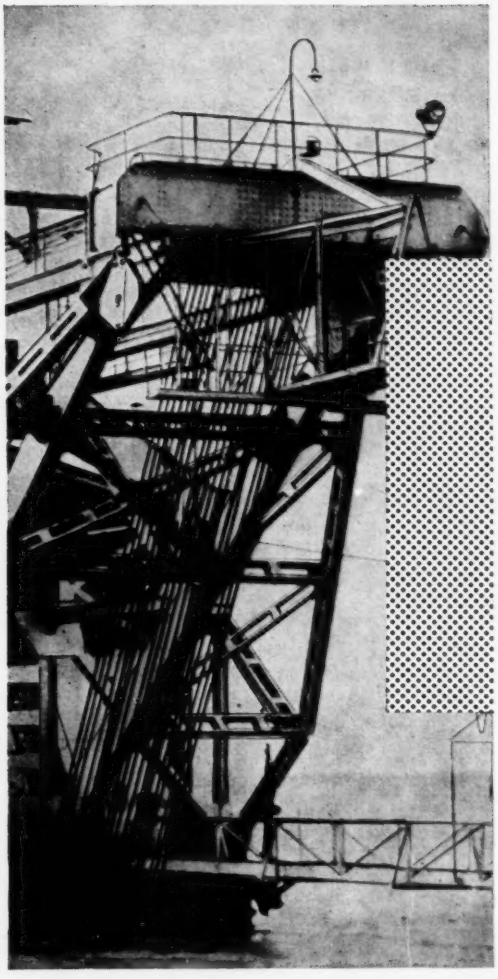
Both the U.K. and E.C.S.C. have large coal industries producing fuel at about the same cost per ton, and are generating electricity at a roughly comparable cost per unit. Yet Britain, in spite of a substantial technical lead in the design and construction of nuclear power stations, is only planning for 4,000 mW. capacity by the late 1960's. On the other hand Euratom—already in its fourth year—is gearing its plans to prepare the Community for the moment, now fast approaching, for large-scale investment in nuclear power stations. It is taking steps both to hasten this moment, and to give Community industrialists a thorough mastery of the technical problems involved.

This was the programme outlined by M. de Groote, a member of the Euratom Commission, in a recent speech at Copenhagen during the Commission's official visit to Denmark. It now seems, he said, that the "nuclear breakthrough"—the point at which large-scale investment in nuclear power stations in certain parts of the Community will become an economic proposition—may come in 1965. If present forecasts prove correct nuclear power will capture half of the new energy market between 1965 and 1970, and two-thirds between 1970 and 1980. Even if the breakthrough is delayed until 1970, the nuclear power capacity required by 1980 will still be some 25,000 mW., and it may well be as much as 40,000 mW.

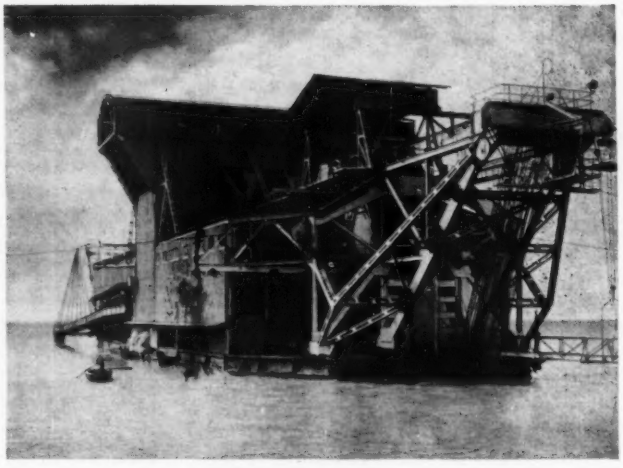
The Community, went on M. de Groote, must make its preparations in good time, because if it failed to do this, it would run the risk of becoming excessively dependent on those countries which will be more advanced in the techniques and application of nuclear power. It was necessary to construct full-size reactors in the meantime to give industrialists a thorough mastery of the problems of construction, organization, and manufacture of the necessary equipment. This was the only way that operators would learn how to deal with the problems arising out of running plants under normal conditions.



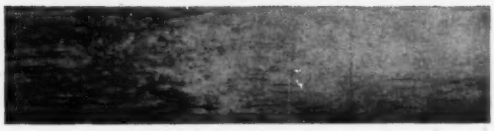
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Five conditions, said M. de Groote, had to be fulfilled before nuclear power could become fully competitive. It had to be technically practicable; there had to be adequate security safeguards; adequate fuel; sufficient capital; and—most important of all—the cost of nuclear electricity must "be on a par with or lower than the kWh. cost of other sources of supply".

Euratom is helping to hasten the "breakthrough" by forecasting energy needs; financial, technical and other forms of material aid; laying down standard health and safety legislation, and the pooling of documentation and information. But its greatest contribution is in the field of research, and the Community intends spending £215,000,000 in the period 1958-63.

The main aim of the Community's research effort is to reduce the cost of nuclear energy. Three distinct types of reactor development are therefore being undertaken. In the first place it is intended to make the reactors already in industrial use more efficient. These are the graphite-moderated, gas-cooled system developed in the U.K. and France; the pressurized and boiling water systems developed in the U.S.A. and the organic moderated type. Here the aim is to improve and perfect techniques, to improve the performance of the materials used, and to manufacture new types of fuel elements. Secondly there are reactors, not yet proved, but which have good prospects of being brought into use for power production. Here research is centred on the development of moderators, coolants and fuel elements, the aim being to gather data for a prototype industrial reactor. In this category is the ORGEL programme for a heavy water moderated, organic liquid cooled reactor, on which the main work at Ispra will be concentrated. Thirdly there are the advanced types of reactor, in which the technology is much less certain, but where there is potential development. The O.E.E.C. high temperature, gas-cooled Dragon project at Winfrith Heath (Dorset), is in this category; another advanced gas-cooled reactor is also being developed in France. In both cases the aim is to improve operation at higher temperatures.

At the same time the Community is also looking further ahead, and contributing to research in more fundamental problems. Of these one of the most important is fusion. In March, for instance, a third contract was signed by the Community for work in this field. This was with the Plasma Physics Institute at Garching, near Munich. The contract will cover an initial period of three years. The total cost of the project is estimated at DM 30,000,000, 33 per cent of which will be borne by Euratom and 67 per cent by the Plasma Physics Institute.

The Community also attaches great importance to close co-operation both with countries already advanced in nuclear technology and international organizations in the same field. For instance, Mr. E. M. J. A. Sassen, a member of the Commission, speaking at Europe House in London on March 16, said that the United Kingdom and the Community should now take steps to transform their co-operation into "a real joint working partnership".

"A broadening of existing co-operation into such a partnership could be worked out", he added, "straight away without changing a single clause in the U.K.-Euratom agreement".

There appears to be little doubt but that nuclear power must be called upon to provide a substantial part of the world's demand for energy by the end of the 20th century—a demand which will probably be three times greater than at present. At the moment, because of improvements made in the economics of conventional power stations, nuclear energy is not competitive. However, such improvements cannot be continued indefinitely and ultimately the rising costs of coal and oil must tip the scales in favour of nuclear power. Whether or not small package reactors similar to those currently in use with the U.S. forces in the Arctic will ever become an economic possibility, remains to be seen. If such plants do become a practicable proposition, what a useful application they would have in the remoter mining areas. Even if package reactors for such purposes never materialize the overall picture cannot be affected. The future of nuclear power is not in doubt: its timing is uncertain. Whatever this date may be the Community does not intend to be caught napping.

BOOST FOR CANADIAN URANIUM

The installation of a $200,000 vacuum melting furnace at the uranium refinery of Eldorado Mining and Refining Ltd. at Port Hope, Ontario, is expected to improve Canada's competitive position in world markets for the sale of uranium fuels for atomic power plants.

Mr. F. H. Hueston of the Crown-owned Eldorado told a conference on nuclear energy recently in Toronto that "with the completion of this piece of equipment Canada will have a completely integrated facility to process uranium from ore to finished nuclear ractor fuel rod assemblies." Up to now uranium forgings from Port Hope have had to be sent to the United States to be processed into metal that can be used in the manufacture of uranium fuel rods.

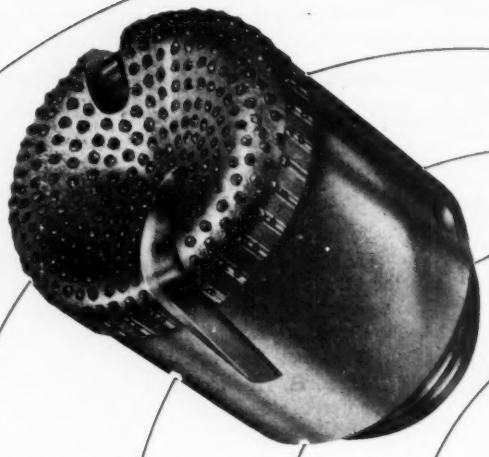
The new furnace will enable uranium metal alloys of various types to be manufactured, some of them for non-nuclear uses, including steel containing small amounts of uranium for added strength. Eldorado's furnace will be one of the largest in the world devoted to uranium processing and should be in operation later this year. It is designed to handle about 3,000 lb. of uranium in one loading.

MINING EXPANSION IN ISRAEL

If the Dead Sea Concession Bill goes on to the Israeli statute book, the exclusive right to exploit the minerals and chemicals of the Dead Sea will be given to the Dead Sea Works. This company was formed in 1952 with the government holding the majority of the shares, one-third being retained by the original shareholders, the Palestine Potash Co. Ltd. It was during the course of the last war that Palestine Potash began a sizeable development programme which led to its becoming the largest industrial concern in the country. During the financial year ended March 31, 1961, potash production by the Dead Sea Works, at Sodom, reached the target of 135,000 tonnes, about 20,000 tonnes above that of the previous year.

The Sodom works are situated some 1,300 ft. below sea level. The prevailing heat, low humidity and high velocity of the winds in this area provide most suitable conditions for the extraction by solar evaporation of potash from Dead Sea brine, an almost unique method of production. Potash content rises from 1.2 per cent in the brine to 23 per cent in the raw material which crystallizes in the pans and after being refined in a near-by factory it attains a purity of 97 per cent KCl (61 per cent K_2O).

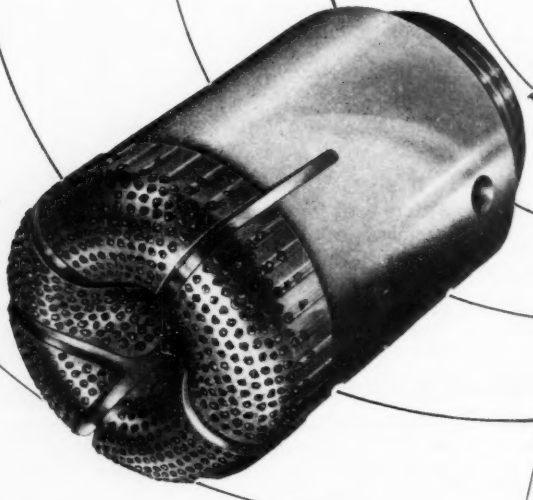
According to a statement made to the Government Finance Committee, stage one of the proposed expansion programme of the Dead Sea Works would raise the capital to I£125,000,000 and would be completed by 1965-66. The capital that has so far been invested in the Dead Sea Works amounts to I£45,000,000, including I£39,000,000. from the Israel government mainly in the form of loans. The intention is to convert I£27,000,000 into voting shares



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and I£12,000,000 into deferred bonds, both to be held by the government. The remaining I£6,000,000 will, of course, be in private hands.

Another important development in Israel's mining industry is an £8,000,000 plan prepared by the Negev Phosphate Company, controlled by the government, to produce 200,000 tons of calcined phosphates annually and to manufacture concentrated phosphoric fertilizer and animal additives at the rate of 140,000 tons annually. West Germany is to supply £400,000 worth of equipment for the calcination plant. Also included in the company's plan is the construction of a £3,000,000 plant for the annual production of 60,000 tons of soda ash. It will be recalled (see *Mining Journal*, March 10, 1961, p. 261) that prospecting rights in the Negev were granted recently by the Israel government to Israel-American Phosphates, which is to prospect over 120 sq. miles in the central Negev. So far only the phosphate rock deposits at Oron are being worked in the Negev.

PAKISTAN GOVERNMENT ACQUIRES ALL MINERAL RIGHTS

Through an order issued by President Ayub Khan, the Pakistan government has acquired mineral rights throughout the country without disturbing existing leases for mineral exploration. Leases and contracts granted since President Ayub took over in 1958 are unaffected, but those entered into by parties other than the government before that date will not be renewed. Present royalties and compensation accruing to owners for surrendering their lands for mineral exploration will continue to be paid during the lease periods. However, the right for an extension of the term of existing leases or agreements is now vested in the central government, and no compensation will be payable in respect of mineral rights acquired by or transferred to the central government.

For the purposes of the Order oil is included in the definition of minerals.

Pakistan, whose chromite output fell from 23,439 tonnes in 1955 to only 16,023 tonnes in 1959, is to build up annual production to 50,000 tonnes by 1964. The industry's expansion is expected to be with United States participation, negotiations having been proceeding between the Pakistani authorities and U.S. companies over a period of months. Licences for the import of necessary mining machinery for expansion schemes have already been granted.

The Pakistan Bureau of Mineral Resources is working on a project connected with the building of a plant for the concentration of low-grade chrome ores and is stated to be considering the erection of a ferrochrome works. Pakistan Industries Ltd., already producing antimony at Chitral, is further reported to be planning a rise in output and the building of a processing plant.

EAST AFRICAN APATITE FOR FERTILIZER VENTURE

Tororo Industrial Chemicals and Fertilizers Ltd., an associated company of the Uganda Development Corporation Ltd., has entered into a managing agency agreement with African Explosives and Chemical Industries (East Africa) Ltd. for the production and sales of fertilizer. Other partners in the £400,000 enterprise are Ventures Ltd. of Canada and International Ore and Fertilizer Corporation of the U.S.A. This marks the first time that a company in the U.D.C. group has been closely associated with A.E. and C.I. and it is expected that the agreement will pave the way for further collaboration between U.D.C. and A.E. and C.I. in future chemical industries in Uganda. The present agreement will run until the end of 1967 and thereafter will be renegotiated on a yearly basis.

An initial yearly output of 25,000 tons of single superphosphate fertilizer is planned by Tororo Industrial Chemicals and Fertilizers in the new venture. The company will use apatite from the Sukulu hills for its basic raw material which will be reacted with sulphuric acid in a process developed at U.D.C.'s technical department and laboratories at Tororo. The sulphuric acid will also be produced by T.I.C.A.F., using 3,000 tons of imported sulphur annually. As the capacity of the acid plant will be surplus to the requirements of the fertilizer plant some 1,500 tons will be available for sale per year.

The managing agents will also act as sales agents for T.I.C.A.F., handling the sales of the total output of single superphosphate fertilizer as well as surplus sulphuric acid. It is expected that the local product will be cheaper than imported superphosphate.

Construction of the plant has already started on the site and full scale production is scheduled to begin in September, 1962 in time to fill part of the fertilizer programme of 1962-3 planting season. Some of the plant and equipment is already on the site, having been used in extensive preparatory work. Simon Carves Ltd. will supply two large items, the sulphuric acid plant and the superphosphate plant for the conversion of apatite into fertilizer.

SASOL'S FIRST PROFITS

The South African Coal, Oil and Gas Corporation (SASOL) the Union's famous oil from coal plant, has made a profit during the last financial year for the first time since it was set up in 1950. Five years ago its turnover was £665,000, now the latest balance sheet reveals a turnover of £8,200,000 and a profit of £677,494. This year SASOL is expected to produce 270,000 s.tons of petrol and other products.

In a paper read to the Commonwealth Mining and Metallurgical Congress recently, Mr. P. E. Rousseau, the managing director of SASOL, said experience had shown that an installation twice the size of the existing plant was economically possible and plans are being considered.

INDIAN GOVERNMENT TAKES OVER KOLAR MINES

The government of India has eventually decided to take over the Kolar Gold Mines from the Mysore government, according to a statement made recently in the Rajya Sabha by Mr. B. R. Bhagat, the Indian Deputy Minister of Finance. (See *The Mining Journal*, May 5, 1961, p. 501.) Details of the transfer of ownership are being worked out between the two governments.

Mr. B. D. Jatti, the Chief Minister of Mysore, who is also chairman of the nationalized Kolar Gold Mines, commenting on the latest development said that during the current quarter there had been a slight rise in the amount of gold extracted from the Kolar mines and also in the average grade of ore.

Referring to the gold mines at Hatti in the Raichur district, Mr. Jatti said that the continued growth of the ore reserves at the planned rate and the promising results of development work during the year ended September 30, 1960, fully justified the expectations that the mines would be in a position to produce at the rate of 1,000 t.p.d. by September, 1964.

Bauxite and Aluminium as Commonwealth Assets

This article is extracted from the Henry Morley Lecture by Wilfred Brining, F.C.A. director, Imperial Aluminium Co. Ltd., "Bauxite and Aluminium with Particular Reference to the Commonwealth", delivered to the Commonwealth Section of The Royal Society of Arts on May 25, 1961

THE Commonwealth has a special interest in aluminium and its source bauxite. Countries of the Commonwealth contain over 40 per cent of the known bauxite deposits and supply about 35 per cent of the requirements of the world aluminium industry. The Commonwealth accounts for 15 per cent of the production of aluminium and about 10 per cent of its fabrication and use, and the great new schemes now in hand will substantially increase these in the next five or six years. Thus, the Commonwealth is able to, and I am pleased to note, does supply most of its own requirements of bauxite and aluminium from its own resources, leaving a substantial margin for export to the rest of the world. The gross value of bauxite, alumina and aluminium produced is probably in excess of £200,000,000 a year and could be doubled when all the new plans come to fruition.

Raw Materials

Although in former years concern was sometimes expressed about the extent of reserves of bauxite, the intensive prospecting which has taken place since 1945 has led to the discovery of many vast deposits, and the latest estimates put the known reserves of metal quality bauxite at 7,500,000,000 tons, and further discoveries are bound to be made. Moreover, bauxite is by no means the only source of aluminium. Processes have been and are being developed for extracting metal from the more widely distributed aluminous minerals.

In short, it appears that there is not, and will not be in the foreseeable future a shortage of aluminium ore, so that the discovery of new deposits is not of itself a guarantee that they will command a ready sale. Why then is so much interest aroused in recent discoveries of bauxite deposits such as those in the Cape York Peninsula, Queensland? The answer lies in the complex balance of financial, economic and political factors such as location of raw material, ownership of mining rights, new techniques, costs of freight, power, other materials, availability of markets, financial atmosphere, taxation, political stability and so on.

One factor which does emerge clearly, however, is the trend towards reducing handling and freight costs. This favours the development of bauxite deposits located near the coast so that within a reasonably short-haul alumina plants may be erected beside wharfage for large ocean-going alumina carriers. Similarly, the factors governing the location of new reduction plants are availability of low cost hydro-electric potential within reasonable transmission distance of navigable waters, so that the alumina may be discharged direct from the ships into the plant and the metal produced despatched to not too distant markets. Integration is taken a step further when all three elements—bauxite, power and harbourage — can be brought close enough together to operate as a unit. This is the attraction of the Volta River scheme.

Technically such schemes have great attraction and seem to offer the best prospects for the further growth of the aluminium industry in economic competition with alternative materials. Political considerations must be taken into account, however. The worth while schemes, by their very size, require very large capital investment, much of which must be found outside, and the return yielded by aluminium production at the present time, at any rate, is not such as to encourage the taking of political as well as ordinary commercial risks. Furthermore, because of the location of bauxite deposits, these large schemes must depend for many years to come on overseas markets for their aluminium output, and here they seem likely increasingly to face the growing urge of all countries to self-sufficiency in aluminium—a tendency which the development of new techniques for treating more widely distributed aluminous materials is bound to increase.

In general the major industrial countries are not importers of aluminium or are self-sufficient. The major exporting countries are Canada, Norway, France, Austria, the U.S.S.R., and the French Cameroons. Since 1959 the U.S.A. has become a major exporter, exporting 254,000 tons of virgin bauxite in 1960.

In both Canada and Norway aluminium production has been undertaken to take advantage of the availability of plentiful hydro-electric power for the reduction process. The eastern plants in Canada manufacture their alumina requirements largely from bauxite imported from British Guiana and Surinam, but the new tendency is to process the bauxite at source, thereby halving the freight costs and improving local economy by increasing the value of the exports from about £2 10s. to £30 a ton. The new west coast Canadian smelter at Kitimat is supplied with alumina produced in Jamaica. Norway also works mainly from imported alumina.

According to official trade accounts, in 1960 the value per ton f.o.b. exporting countries averaged £2—£3 for crude and dried bauxite and £7—£8 for calcined bauxite.

Freight and Power Costs

Freight charges and thus location play a vital part in the cost of aluminium production. A. L. Ellis has listed the sources of supply of the Bell Bay smelter:

Material	*Source*
Bauxite	Bintan Island
Soda Ash	South Australia
Limestone	Local
Pitch (7,000 tons p.a.)	U.K.
Petroleum oil coke	U.S.A.
Anthracite	U.K.
Cryolite	Greenland and Germany

Electric power is the one component which cannot be transported over very long distances and hence the tendency has been to locate the reduction plants where low cost power is available—generally this has meant water-power—with reasonable accessibility to markets for the metal.

The cost of power is one of the principal charges on the conventional electrolytic reduction process despite the considerable advances made in reducing specific consumption in recent years, which is of the order of 18,000 kWh. per ton of aluminium produced. Recently published figures indicate that in the U.S.A. power costs ranging from 0.17 to 0.31 pence per kWh. account for 6½ per cent to 12.7 per cent of the selling price of the metal, i.e., £13½ to £27 a ton. A. L. Ellis puts the figure rather higher.

At present the lowest cost producers in Canada, Norway and U.S.A. pay about 0.17 pence per kWh. and this figure seems to be the target for new aluminium projects. This is the estimated cost for the proposed installation at Bluff in New Zealand and for the Volta River scheme.

Capital and Operating Costs

The new aluminium facilities being built and projected involve the expenditure of huge capital sums. The cost of a particular project varies, of course, according to its scope and location, but in order to give a rough idea of what a new aluminium project may cost, I have listed some recently published figures for a number of projects:

Location	*Capacity tons p.a.*	*Capital £ millions*	*Year*	*Capital Cost per ton-year of aluminium capacity (2 ton alumina — 1 ton aluminium)*
Alumina Plants				£
British Guiana	230,000	13½	1961	120
Jamaica ...	730,000	35½	1957	100
West Africa ...	230,000	11½	1959	100
Aluminium Smelter				
West Africa ...	120,000	24	1959	200
Combined Hydro-Electric, Alumina and Aluminium Installations				
Volta River ...	180,000	123½	1960	686
Australia and New Zealand	148,000	100	1961	700

It would appear, therefore, that the cost of a complete scheme from bauxite to aluminium is about £700 per ton of aluminium producing capacity. This may not be the whole cost, however. The report of the Preparatory Commission on the Volta Project estimated that in addition to the capital cost of the dam, power installation, smelter and mines amounting to £757 per ton, the cost to the Ghana Government of the necessary railways, docks, etc., would add another £340 per ton, making over £1,100 per ton in all. Of course, not all of this sum is chargeable to aluminium production, but it does indicate the scale of investment which may be necessary before production can begin.

Detailed costs for aluminium production are not easily come by. The most recent figures I have been able to find were published in 1957 and are as follows:

Cost of Producing Aluminium in a U.S.A. Plant of 62,000 ton capacity
(converted at $2.80 to £1)

	£ per ton
Electricity	30.6
Alumina	56.6
Cryolite and AlF_3	6.0
Labour (including overheads)	19.2
Repairs and maintenance	8.0
Electrodes (Anode Paste)	12.0
Miscellaneous plant costs and indirect overheads	13.6
Total operating costs	146.0
Freight to customers	8.0
Amortization, interest and profit	54.0
	208.0

It will be noted that the cost of electricity given for this plant is a good deal higher than those of the projects to which I have referred.

Future Demand

N. V. Davies, a leading figure in the world aluminium industry, has recently given a thoughtful assessment of the outlook for aluminium in the next few years. He estimates that demand in the non-communist world will continue its recent rate of growth of 2-4 per cent per annum, reaching 5,000,000 tons by 1965 (which is more or less in line with the Paley report). Presently planned production capacity should then at least equal that demand but, he warned, capacity could easily exceed 7,000,000 tons if other contemplated expansion projects are embarked on too quickly and with too little regard for reality. This would perpetuate the present over-capacity in the industry.

In contrast to this sober point of view, we have the more optimistic viewpoint expressed by certain American organizations that the consumption of aluminium has increased by 10 per cent per annum over the past 10 years and that there is no reason to doubt that it will continue to expand at the same rate for the next 10 years. This view is reinforced by the great differences between *per capita* consumption in the U.S.A.—at present 22.3—compared to the next highest—Western Europe—now 6.5 lb.

Undoubtedly the Commonwealth offers a vast potential market for aluminium. At present its 700,000,000 people use less than 500,000 tons a year of aluminium between them—about 1.57 lb. *per capita*, and if we exclude U.K. consumption, the figure becomes less than ½ lb. Consumption of aluminium foil alone in U.K. is at the rate of 1 lb. *per capita*, not counting the considerable volume of foil wrappings of imported commodities. An increase of Commonwealth consumption to the still modest average of 3 lb. a head during the next ten years would raise the consumption of aluminium in the Commonwealth to almost 1,000,000 tons a year and, looking further ahead, an overall increase to the present West European rate of *per capita* consumption would double Commonwealth demand again —more than the consumption of the whole world less than ten years ago (1,957,300 tons in 1952).

The expansion programmes which I have mentioned will naturally raise the question of " Where will the consumers come from? " The brief answer is—the consumers are here now. Taking the Comonwealth as a whole, the consumption of aluminium *per capita* is 1.57 lb. per annum. In the U.K. the figure is 14 lb. and in the U.S.A. 22 lb. The advancement of standards of living resulting in a Commonwealth usage on U.K. levels will call for 4,000,000 extra tons of aluminium, whilst to reach U.S.A. standards an extra of 6,000,000 t.p.a. will be needed; a most encouraging picture.

Pollucite in Canada

THIS brief account is in response to numerous enquiries regarding caesium, its minerals, and prospecting possibilities in Canada. A substantial deposit of high-grade pollucite has been blocked out at the mine of Chemalloy Minerals Ltd. at Bernic Lake in south-eastern Manitoba and a minor amount has been found at the Valor property in Lacorne, Abitibi county, Quebec. Current markets are limited, in terms of available supplies, but the possibilities of considerably expanded demand in the future are considered good.

This survey, by R. Mulligan, has been published by the Geological Survey of Canada, Department of Mines and Technical Surveys, as Paper 61-4, price 25 c.

Properties, Uses and Prices

Caesium is the heaviest of the alkali group of metals. It is a silvery-white soft metal that reacts violently with air or water.

Due to its sensitivity to visible light, and parts of the infra-red and ultraviolet spectra, caesium is used in various photo-electric devices. These include photomultiplier tubes and infra-red lamps, telescopes, and spectrometers. It is used in vacuum tubes, scintillation counters, frequency and time standards, in ceramics, analytical procedures, and chemical and metallurgical processing. Caesium radio-isotopes have a number of potential uses. Thermo-electric power plants of the plasma-thermocouple and thermionic types employ caesium, and it may eventually be used as a fuel in ionic-drive rocket engines.

According to Barton (*Mineral Facts and Problems*, U.S. Bur. Mines Bull., 585, 1960) caesium metal in 1958 was priced from $1.10 to $5.00 a grm., technical-grade compounds from $22.50 to $27.50 per lb., and CP-grade compounds from $0.40 to $1.00 a grm. Pollucite ore or concentrate containing 25 to 30 per cent Cs_2O was valued at about $0.50 per lb. in 1957. According to Brinsmead (*Precambrian*, 33, 8, p. 19) pollucite was offered by Chemalloy at as low as 15 c. per lb. at the mine in 1960. There is no U.S. import duty on the ore, but the metal is dutiable at 21 per cent, and caesium chloride at 12½ per cent.

Production and Consumption

Southern Rhodesia and South West Africa, the principal world suppliers, have produced less than 100 tons of pollucite annually, with shipments of less than 15 tons annually to the United States and Europe. No pollucite has been produced in the United States recently. Most of the 1958 production of caesium and its compounds was from ALKARB, made by San Antonio Chemicals, Inc., San Antonio, Texas as a by-product of lithium extraction from lepidolite. ALKARB contains about 2 per cent caesium carbonate. Less than 1 ton of pollucite was consumed by the U.S. domestic caesium industry. In West Germany two companies produce caesium compounds from African pollucite.

Mineralogy

Pollucite ($2Cs_2O \cdot 2Al_2O_3 \cdot 9SiO_2 \cdot H_2O$) is the principal primary mineral of caesium, and contains about 27 per cent Cs_2O. Its hardness is 6.5 and specific gravity 2.901. It is isometric and occasionally occurs in cubes but is generally massive. It is colourless to white, or greyish or pinkish white with a vitreous lustre, and may closely resemble quartz. However, the Chemalloy and Valor material commonly contains numerous veinlets of white material, part of which is fine-grained spodumene, and also characteristically has veins and patches of fine-grained purplish lepidolite. At the Valor property, where the pollucite is exposed on the surface, it has a dull greyish white weathered surface with a rough texture, in which the white veinlets are visible.

Rhodizite—a rare hydrous borate of aluminium, beryllium, and alkalis, found in the Urals and Madagascar—commonly contains some caesium. Lepidolite also contains variable minor amounts and is an important commercial source of by-product caesium. (A simple and effective chemical test for the detection of caesium is given in the paper).

Mode of Occurrence

Pollucite occurs in some complex, generally well-zoned pegmatites that are rich in lithium minerals, notably lepidolite. This assemblage is present at the Chemalloy and Valor occurrences, also at Bikita, Southern Rhodesia, at Varutrask, Sweden, at East Kazakhstan, Central Asia, at the Newry and other pollucite occurrences in Maine, and elsewhere in the United States. The mineral composition differs in detail from one to another of these occurrences, but lepidolite is present at all. Lepidolite and cleavelandite—the platy form of albite—are supposed to indicate late-stage pegmatitic activity, which is probably a necessary condition for the occurrence of pollucite. Beryl is present at most if not all occurrences and may indicate that a prolonged period of concentration of material, from early to late stage, is necessary.

At the Chemalloy (formerly called 'Montgary') property in southeastern Manitoba (Hutchinson, 1959; Brinsmead, 1960), pollucite occurs in a lenticular mass or unit nearly 500 ft. long and up to 60 ft. in maximum thickness, a large part of which is nearly pure pollucite. The pollucite unit is gently dipping and, in general, concordant with the overall attitude of the pegmatite in which it occurs. It is in the upper-central part of the pegmatite body, which is distinctly zoned, and is bounded above and below for the most part by spodumene-rich assemblages. It is associated with, but not confined to, quartz and quartz-amblygonite bodies that represent a core unit. Cleavelandite - lithia - mica assemblages commonly rim the quartz-amblygonite bodies, and lepidolite-albite and petalite assemblages occur in the same general zonal relationships. Beryl and tantalite occur rather prominently in parts of a lower-central albite-rich zone, and scattered beryl crystals are found in outer zones near the tourmaline-rich borders.

At the Valor property, in Lacorne, Quebec, masses of pollucite up to 5 ft. in maximum exposed dimension are scattered through part of the lenticular core zone of a complex zoned dyke. This zone consists chiefly of quartz, cleavelandite, and spodumene, with irregular masses and disseminations of lepidolite. Beryl also occurs here and there in the core but is more prominent in the core selvedges, and in a surrounding feldspar-quartz-muscovite pegmatite-aplite assemblage.

Developments in the British Coal Industry

THE National Coal Board recently has described several developments of benefit to the industry that are the product of the experience and knowledge of workers within the industry itself.

Multi-layer Rope Spooling

In mine shaft man-hauling arrangements difficulties are experienced in obtaining regular layers of rope as it is wound on to the drum. If the layers are not regular there are jerks on the rope—a drawback when machines are being hauled and intolerable during man-hauling. It has therefore been common in coal mining to wind the rope in a single layer on a large diameter drum. But such large drums are expensive, and inconvenient in mobile winder units. A device invented in the East Midlands Division, is intended to improve the existing arrangements.

A feature of this assembly is that the distance between the two side members of the drum is such that the odd-numbered layers of rope all start in contact with one of the side members and the even numbered layers all start in contact with the other side member, the laps of each layer except the innermost lying in the spaces between the laps of the next adjacent inward layer.

Figure 1 is a fragmentary sectional elevation illustrating the positions of the laps and layers of a rope wound on a drum. The other figures are corresponding plan diagrams illustrating the cross-over pattern of the rope. A rope R is wound on a drum comprising a barrel 10 with two side members 11 and 12. A steel triangular shaped packing piece 13 is provided to fill the space between the innermost layer of rope and the side member 11. The innermost layer of rope starts at (a) in contact with the side member 11 and ends at (b). The laps of the innermost layer are in close contact with one another, and at (b) there is a space equal to half the diameter of the rope and the side member 12. There is a transition portion from (b) to (c) and another from (d) to (e).

Figure 2 illustrates the pattern of the innermost layer of rope, Figure 3 the pattern of the second layer, and Figure 4 the patterns of the innermost and second layers together, the pattern of the innermost layer being shown in dotted lines and that of the second layer in solid lines.

The Bretby Mark 3 Canopy

The National Coal Board's Central Engineering Establishment has devised a protective canopy and arch setter for tunnelling operations which is intended to give greater protection against falls of ground than the conventional forepoles and brackets, and also to provide mechanical assistance for arch or girder setting.

A box girder, rectangular in section with a longitudinal slot along its upper surface, is supported by brackets fixed to the steel arches or girders supporting the roadway. The brackets take the form of an inverted "T", the horizontal part of which is inside the box girder, and the slot permits the girder to span several brackets and to be moved along them.

From the box girder is supported a main horizontal beam, the foremost end of which is divided into two parallel beams about four feet apart, which support the canopy. The rearmost ends of these beams are pivoted at the ends of a short beam bisected at right angles by the main beam. They are joined together by a transverse

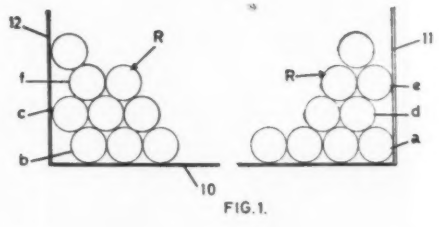
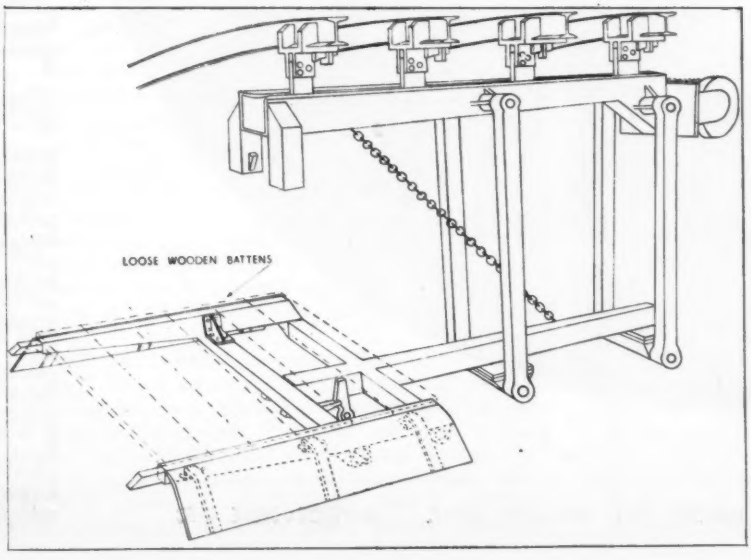


FIG. 1.

Below, the Bretby Mark 3 canopy for protection during tunnelling operations and for mechanical assistance during arch or girder setting At right, illustration of the multi-layer rope spooling described on this page



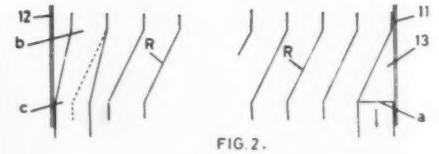


FIG. 2.

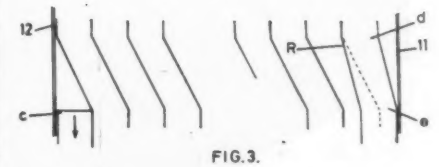


FIG. 3.

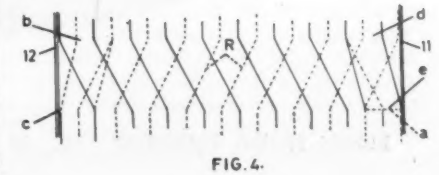
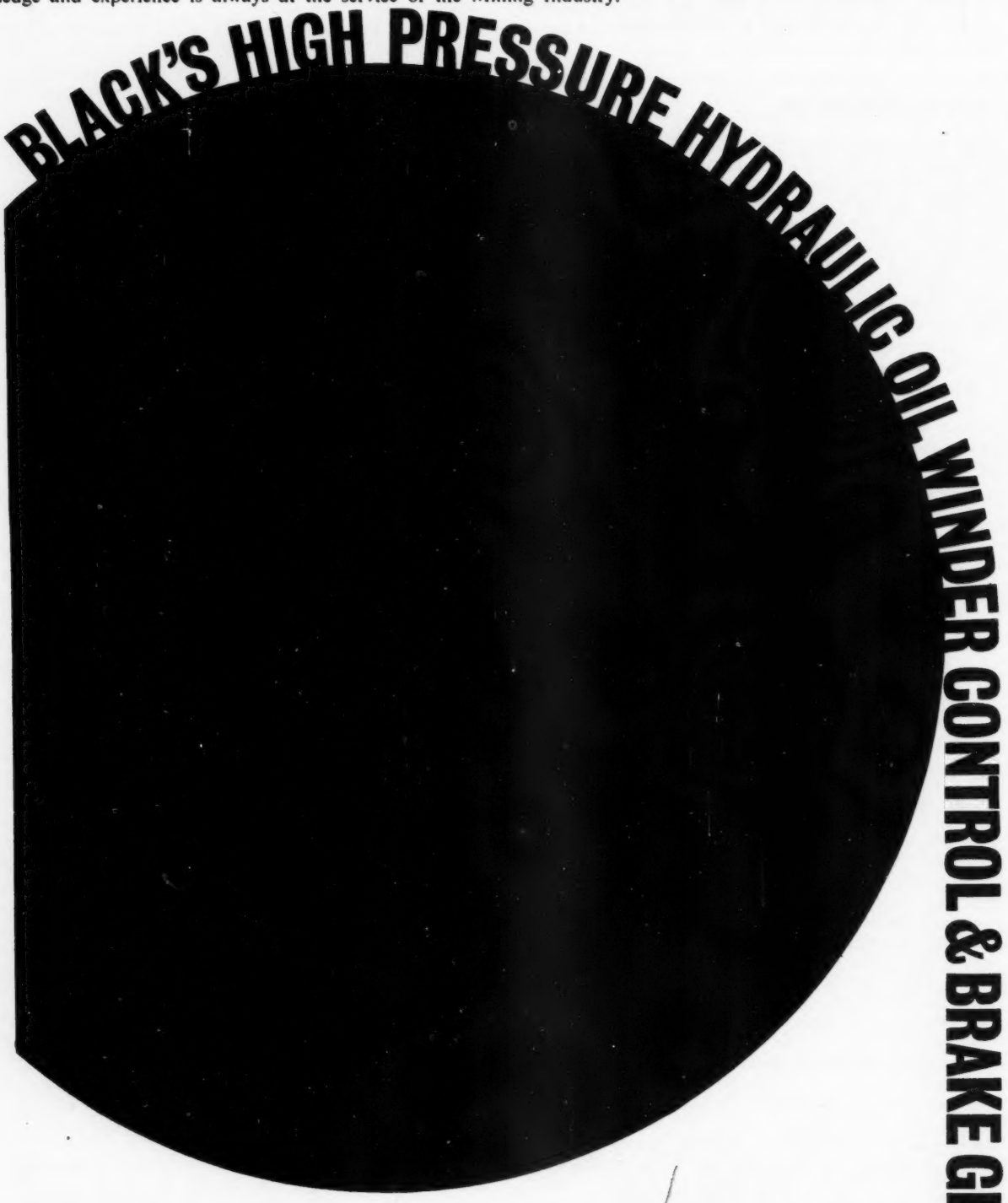


FIG. 4.

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member which is arranged to be supported on two catches at the end of the main beam. These catches may be released by pulling from the rear of the canopy using a sylvester, air winch or locomotive. Releasing the catches causes the canopy to tilt downward, discharging any debris which might be upon it in a forward direction, away from the operators or other equipment in the tunnel. The two parallel beams are extendible to allow them to be securely lodged in the face when necessary.

The main beam is supported by four arms pivoted on the box girder to swing forward and upward into a near horizontal position when lifted by the air winch via the steel rope and chain. It is latched up by two spring catches which are released from the rear when it is required to lower the canopy. The chain can be fixed by a locking device to hold the canopy at any desired height, and the rope may be run out in either direction and attached to any fixed object (e.g. a steel arch) to move the canopy to or from the tunnel face. The arch crowns are placed across the canopy and raised to the required height. The side members of the arches may then be bolted to the crowns, and set to line and level under cover of the canopy.

In the North Eastern Division an apparatus, has been devised, at much reduced cost, for separating water from froth flotation tailings to the point where the solid residue can be handled for disposal as refuse.

What has come to be recognized as the traditional method for treating froth flotation tailings is the concentration of the tailings in a thickener, and further contentration of the sludge to a firm cake in filter presses, this firm cake being transportable by belt conveyor, dumper or ropewaybuckets along with the normal washery discards.

A range of new flocculating re-agents has recently been made available. These re-agents, some of which are being patented, give quite high settling rates, i.e. in excess of 2 ft. per minute. (The older re-agents usually worked at 3 in. to 5 in. a min.) More important is that the settled sludge appears to be almost water repellent in that it will freely drain, and when subject to slight mechanical movement becomes almost solid. With settling alone it consolidates to a handleable mass. The residual water is clear.

The new apparatus has been designed to take advantage of these properties. The apparatus essentially is a cone of greater depth than diameter. The process receives the tailings that would normally have gone to the thickener. The dilute re-agents are fed into the tailings, which are then agitated and passed to the centre curtain of the cone. Flocculation is instantaneous and gives a continuous clean water overflow from the rim of the cone. The sludge settles to the bottom of the cone and is released by a suitable discharge, which could be the subject of automatic control. This sludge is sufficiently rigid to travel to disposal by the normal methods (rubber belt, scraper conveyor, dumper or ropeway bucket) without any further treatment. Further dewatering of the material can be achieved by subjecting it to suitable mechanical movement within the cone or after discharge from the cone.

British Steel Prepares for Export Drive

By 1965 Britain's steel industry should have a " reasonably modern and efficient " crude steel capacity of 32,000,000 tons, states the Iron and Steel Board in its third special report, 1961 on the Iron and Steel Industry (H.M.S.O. 7s.). This target compares with a less assured one of 29,000,000 tons set three years ago for 1962, and with an output of about 24,300,000 tons last year.

Sir Cyril Musgrave, chairman of the board, commenting on the report says, " by the end of next year there should be adequate capacity to meet all requirements including a reasonable margin for exports, and by 1964 all that capacity should be efficient and up-to-date. For the first time since before the war, he said, the industry could go out for maximum exports without holding back because of the possibility, if not the certainty, of shortage of supplies at home. He pointed out that because of the competitive nature of steel supplies the cost of making steel would be of paramount importance. Thus over the next few years the emphasis would shift from the expansion of output to the improvement of efficiency and costs.

Looking even further ahead to 1970 the report suggests that a crude steel capacity of the order of 35,000,000 tons may be required. The Board seems confident that after 1965 substantial increases in capacity will be possible for relatively modest capital expenditure. On the raw materials side it is thought that considerable progress may be possible in the more economical handling and transport of iron ore, while economies in the removal of deep overburden and in the mining of U.K. ores will also become increasingly important.

Last year the industry's output of about 24,300,000 tons was nearly 50 per cent more than in 1950 and compares with the increase in world steel production of 82 per cent. The largest increases since 1950 have been made in Japan (358 per cent), U.S.S.R. (137 per cent) and Western Germany (150 per cent). During the next decade Japan with a crude steel production of 21,800,000 tons in 1960 and China, with her vast expansion plans, may well challenge Britain's present position as the world's fourth largest producer.

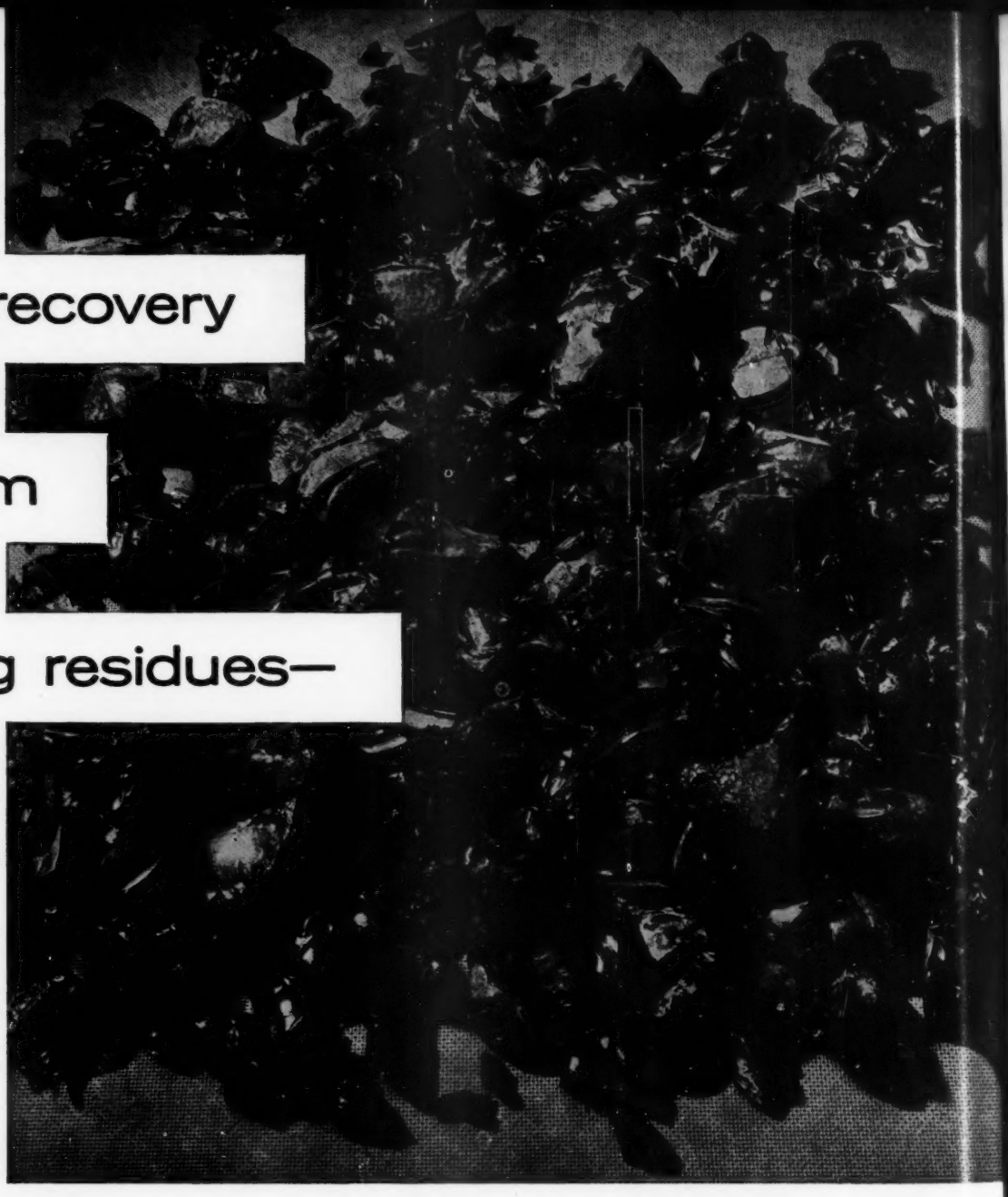
The increase in Britain's steelmaking capacity during the last 15 years has been more than matched by increased pig iron capacity, and while there has been a marked expansion in the use of domestic ore much of the additional ironmaking capacity has been situated on the coast and based on imported ore, which last year was 14,800,000 tons compared with only 5,600,000 tons in 1946.

Costs of production vary widely in domestic orefields dependent on the nature and depth of the overburden and other physical factors and, because most of the remaining and newly discovered deposits lie at somewhat deeper levels than those at present being worked, future development and extraction costs are likely to be higher than the current average. But costs can be levelled out, the board suggests, if more of the deeper reserves are opened up now and worked with shallower reserves. In this way ironmaking based on their use should continue to be competitive with that based on imported ores.

By 1970 the consumption of home ore is expected to rise to 32,000,000 tons. A comparable 1970 estimate for imported ore is not given in the report but it is estimated that by 1965 between 24,000,000 and 27,000,000 tons of imported ore will be required and most of it will come from Sweden, Canada, and West Africa. Owing in some cases to exhaustion of deposits and in others to a fall in the demand for a particular type of ore, imports from such long-standing suppliers as Spain, are falling.

Britain's main competitors for overseas ore will be the countries of the European Coal and Steel Community and the United States while demand in the ore producing countries themselves will increase with the development of their own iron and steel industries. Although resources are considerable enough in total to preclude their exhaustion in the foreseeable future, continuous prospecting and development will be required to ensure that economic supplies of the desired type are always available.

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RII/708

MINING MISCELLANY

A Japanese company has bought the mineral rights of the Sutskwe mine in Southern Rhodesia, from its British owner. The mine is situated about 120 miles north-east of Salisbury. The Tokyo firm plans to set up a subsidiary, called Matsuo-Rhodesia Ltd. to extract tantalum and beryllium ores.

★

Elettrosiderurgica Sarda (IES), which is to build an iron and steel works in Sardinia, will employ the Udy direct reduction process. IES will use power from the thermal station now under construction (to exploit the Sulcis coal) to produce pig iron and 110/150,000 tons of steel a year. Reserves of iron ore of excellent quality are estimated at a minimum of 50,000,000 tons.

★

The Sumitomo Metal Mining Co. and the Sumitomo Shoji Kaisha, a Japanese trading company are to participate in the development of Canadian copper mines, Sumitomo has announced in Tokyo. The mines will supply copper concentrates to Japan. Sumitomo has already concluded contracts with the Bethlehem Copper Corporation to finance and invest $U.S.5,500,000 in the development of the Bethlehem copper mines in British Columbia, and to buy copper concentrates mined there on a long-term basis.

★

The Fred Mine, at Filabusi, Southern Rhodesia, one of the oldest gold producing mines in the country and by far the most important producer in the district, is closing down. This was stated in Bulawayo by Mr. F. L. Widley, a director of Rhodesia Corporation Ltd., who acquired the mine in 1928. He said poor development results on the Redwing section and difficult mining conditions was the reason for the closure.

★

Exports of Australian coal to Japan have been strengthened by the signing of a new five-year contract for the delivery of 1,300,000 tons of coal to be used by the Yawata Iron and Steel Co. The contract was signed by the Brown and Dureau Company of Australia and the Nichimen Trading firm of Japan, which will import the coal for the Yawata Company.

★

It is reported from Saigon that South Vietnam is to exploit deposits of iron ore, cupreous ores and other minerals. The Nong Son coalmines are to raise annual production to 240,000 tonnes by 1964.

★

The Mercantile Metal and Ore Company of the U.S. has granted credit amounting to $800,000 to the D. Skalistiris company of Athens for the expansion of its Mantoudi magnesite mines on Euboea, Greece, to a daily capacity of 30 tonnes of double-burnt magnesia. Credit is to cover $200,000 for boring equipment, $200,000 for capital, $150,000 for preparatory work, $155,000 for plant and machinery, and a further $95,000 for other purposes.

★

A salt deposit 100 m. thick, has been discovered during the course of a search for mineral oil at Malessert, near Sorens in the Swiss area of Gruyere. Boring, which has already been taken down to 2,300 m., is to continue to a total depth of 3,000 m.

★

Norsk Hydro have chosen the island of Karmoy in the Norwegian region of Fylke Rogaland for the site of the new aluminium plant, with capacity of 100,000 tonnes annually. Construction of the plant will take place during the next ten years.

★

Frontino Gold Mines of Colombia are planning the erection of a lead smelter at Medellin, Colombia, and a zinc smelter at Bogota. The lead plant will be operated by the CELINA interests, and the zinc works will be built in association with Metales Associados S.A. Frontino will supply the plants with 120 tonnes per month of lead concentrates and 40 tonnes per month of zinc concentrates from its Segovia mines in the Antioquia region. These concentrates have hitherto been exported to the U.S.

★

The East German news agency ADN reports the finding of new deposits of magnesite, non-ferrous metals, salt, mineral oil and natural gas in the Slovakian region of Czechoslovakia. Exploratory work in Northern Bohemia has discovered deposits of non-ferrous metals, including copper-nickel ores, lead and zinc. New reserves of brown coal have been located on the Czech-German border, near Zittau. Current searches are being made near Semily for cupreous ores and near Novo Mesto for tin and copper.

★

The Pakistan Industrial Development Corporation are considering a scheme for transporting coal 30 miles by ropeway from the Quetta and Kalat coalfields. The scheme, which would cost about Rs. 12,000,000, and would take three years to complete, would link the P.I.D.C. collieries in the Sore Range and Degari areas with Ab-i-Gum railway station, from whence it would be carried to other areas by train. The ropeway would carry about 300 t.p.h.

★

A heavy machinery plant, one of twenty-six industrial and power projects

(Continued overleaf)

The McFadzean Laboratory

On May 16, 1961, the Duke of Edinburgh performed the opening ceremony at the McFadzean Laboratory, the latest addition to the Research Organization of British Insulated Callender's Cables Ltd.

The McFadzean laboratory at Wood Lane, London, is a six-storey building providing 64,000 sq. ft. of floor space and was erected at a cost of approximately £500,000. The major part of the building is devoted to air-conditioned research laboratories, with the most modern design features and facilities for the efficient and effective carrying out of research programmes.

The laboratory, named after the chairman of BICC, is the latest addition to the group's research facilities. It accommodates the instrumentation and control department, the physics department, British Dielectric Research Ltd. (a group subsidiary for research on capacitors), the diffraction and microscopy department and, in addition, the electronic computer which is an important part of the facilities of the mathematics department, the main offices of which are elsewhere. The laboratory contains also the drawing office, the photographic section, the main conference room, a lecture room, some adminstration offices and catering and social facilities.



to be built in India with Soviet technical assistance under the third Five-Year Plan, is being set up near Ranchi. This plant is to produce equipment for the metallurgical industry, and a mining equipment plant is under construction. Soviet specialists will also assist in the development of the coal and certain other industries.

★

About 20 senior technologists from major battery and cable companies and research organizations in the U.K. attended a recent meeting arranged by the Lead Development Association, to discuss modifications to the mechanical properties of lead applicable to their industries. The Association intends to hold similar meetings at future dates.

★

A Brisbane group has obtained rights to explore a silver-lead find in the Kilkivan Range, eastern Queensland, which was disclosed after intensive surveying and geological examinations of the area. Mr. W. J. Gourley who heads the group, stated that they had decided to take an option on the syndicate's 200 acre lease of Mt. Victor, after a highly promising report on the area.

★

A survey team for the Japanese firm Fuji Iron and Steel has reported that iron ore mining in South America is likely to increase from the present 35,000,000 tonnes a year, to 60,000,000 tonnes annually. Japan could expect to obtain about 10,000,000 tonnes annually from this source by 1970. It was stated that Brazilian deposits, in particular, were of high iron content and that, while Brazil's current output amounted to 5,000,000 tonnes annually, this was likely to rise to 30,000,000 tonnes in the near future.

★

An application for $50,000 for a sea water conversion plant has recently been granted in Chile. This installation will supply 35,000 gallons per day of fresh water to a new power plant erected by the Chile Exploration Co., a subsidiary of the Anaconda Co. at Tocopilla. Some of the water is also being used for power plant employee consumption. Located on the sea coast, the power plant transmits electricity by high-tension lines to the Anaconda Co.'s copper concentrator and electrolytic refinery many miles distant at Chuquicamata.

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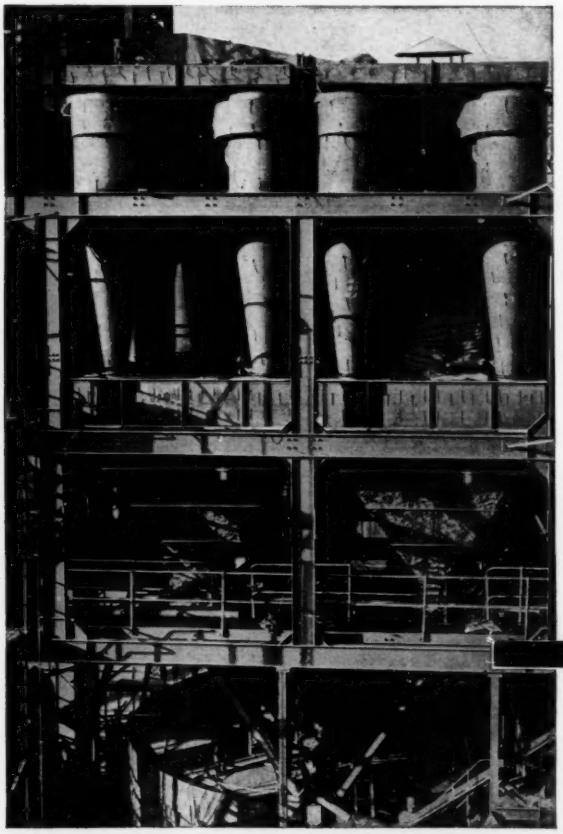
The Second Chamber of the Dutch Parliament has approved a bill authorizing the government to conclude a 75-year contract with a Dutch-American company for the exploration and exploitation of minerals and ores in Netherlands New Guinea. The bill will now go to the Upper House for final approval. The company will be jointly established by the Oost Borneo Co. and the Nederlandsche Handel Co., both of Amsterdam; Wm. H. Mueller & Co. of Rotterdam; the U.S. Steel Corporation of Pittsburgh, U.S. and the Navigen Co. of Nassau, Bahama Islands. Under the contract, the company will get concessions for the exploration and exploitation of iron, nickel, cobalt, chromium, manganese, pyrite, platinum, gold and silver bearing ores and minerals in the Cyclope Mountains, a large area of Waigejo and a number of small islands belonging to New Guinea. The ores and minerals will be processed in New Guinea if possible.

★

A former director of Nyasaland's Geological Survey is reported by Barclays Bank D.C.O. to have stated that, although 50 minerals of commercial importance are known to occur in the country, few could be economically workable. Among these few, however, are bauxite deposits on the Mlanje plateau, and coal in the Northern Province (both of which are at present considered inaccessible and uneconomic). But a number of mineral deposits might possibly become commercially attractive should local and world demand increase sufficiently.

★

Noranda Mines of Canada is reported to be interested in purchasing two copper ore deposits in Northern Chile, 150 km. from Antofagasta. Exploraton work at these deposits, Julia and Abundanicia, has already indicated an estimated 800,000 tonnes of 2.5 per cent copper ore. A representative of Noranda stated that the company was interested in starting the operation and treatment of the ores by a leaching process, and that if the deal was carried through, would install a treatment plant.



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The illustration is one of three installations for Joseph Crosfield and Sons Ltd. of collectors applied to a spray dryer.

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B 9

Machinery and Equipment

A Stable Hole Conveyor

A stable hole conveyor lately produced by Richard Sutcliffe Ltd. has been designed for the maintenance of stable holes in advance of the coal face and for the reduction of the manpower required to remove coal or stone at this point. Easily transported, the conveyor can be used wherever coal or stone has to be moved short distances in confined spaces. The machine has a capacity of 50 t.p.h. at a belt speed of 140 f.p.m.

The normal drum centres are 10 ft. with a 3 in. adjustment. The electric drive is made up of a heliocentric gear mounted in a drum shell of Sutcliffe manufacture and powered by a flange mounted Brook motor. The motor is continuously rated at 1.33 h.p. with a starting torque of 180 per cent full load torque and a guaranteed starting current of not more than 42 amps. The motor is suitable for starting with drill panels to N.C.B. Standard Specification P9/1950. The belt supplied is P.V.C. 3-ply, 32 oz. Tugron duck with 3/64 top and back covers. Normal drum centres are 10 ft.

The entire unit is transported by sliding on steel skids, and the frame is fabricated from mild steel sheets which form a trough for the top belt and at the same time provide complete protection for the bottom belt. A hopper is fitted at the loading end to receive the material and removable spill plates are fitted for the full length of the machine at one or both sides as required.

Overall length of the conveyor unit is 11 ft. 3 in., width 3 ft. 2 in., while the complete weight is 702 lb. Without the detachable spill plates the unit weighs 584 lb.

FURNACE FOR NON-FERROUS METALS

A new type of two-chamber mains-frequency furnace, for the simultaneous melting and holding of non-ferrous metals, has been designed and launched on the market by Asea. The equipment has been described in *The Eastern Metals Review*.

Claimed to be particularly useful in conjunction with die-casting of aluminium and its alloys as well as brass, our contemporary points out that the new furnace may also be used for melting both ferrous and non-ferrous metals for mould casting. The two chambers of the furnace are accommodated in a robust sheet-steel casing and are connected to one another by means of two melting ducts, between which the air-cooled furnace transformer is mounted.

The charging material in the form of ingots or scrap is placed in the charging or making chamber, while the molten metal is taken out with a ladle from the holding or casting chamber and transferred to the die-casting machine or mould. The temperature in the holding chamber is regulated automatically to the desired value. Provided that the melting chamber is not charged irregularly, a continuous supply of molten metal will always be available at the desired temperature.

One of the advantages of this two-chamber furnace — besides doing away with troublesome and costly transport of molten metal — is that the bath movement in the melt ensures an almost pure surface, since the greater part of the oxides and impurities will remain in the melting chamber. If any impurities should penetrate into the holding chamber they tend to accumulate on the inside of the bath surface, close to the centre of the furnace. The furnace does not require any special foundation and it can be placed direct on the floor, even when it is fitted with a special tilting arrangement.

COAL NOTES

The first use of a high expansion foam plug to control an underground fire in a commercial coal mine in the U.S. is analyzed by the U.S. Bureau of Mines in a technical publication recently released by the Department of the Interior. The fire, in a western Pennsylvania coal mine, grew to "very serious proportions" in 10 hours while being fought with conventional methods only. Explosive gases generated by the fire increased to the point where firefighting was about to be abandoned when a foam generator was brought into the mine and turned on. As the foam reached the fire it dramatically reduced the concentration of combustible gases and thereafter kept the potential explosion hazard to a minimum.

Before the fire was finally sealed, the foam generator twice was moved to other critical areas where the fire threatened to spread. Each time the foam effectively controlled the leading edge of the fire and made it possible to resume sealing. The Bureau concludes that although foam is not a cure-all or substitute for standard firefighting equipment, it can be an invaluable supplement.

A new form of resuscitating apparatus has been devised in the Scottish Division, at the National Coal Board's Coatbridge Mines Rescue Station. The assembly enables unconscious people to be carried from irrespirable atmospheres with more ease and efficiency than with existing types. Being less bulky, it is easily transportable by one person and can be laid on a stretcher to free bearers from the often impossible task of carrying a stretcher and the existing type of reviver at the same time.

The apparatus consists of a 20 cu. ft. cylinder of oxygen to which is attached a reducing valve set to pass 40 lb. p.s.i. A short rubber tube is attached to a lung demand valve attached to a full face mask. The demand valve is balanced at 40 lb. p.s.i. pressure, cutting off the oxygen during exhalation (when it is not required) and opening at the slightest inhalation. No component parts of the apparatus are new but the complete assembly is original. Because of the complete mask seal, artificial respiration can be applied immediately even in an irrespirable atmosphere by rescue men wearing breathing apparatus, before the patient is removed to fresh air.

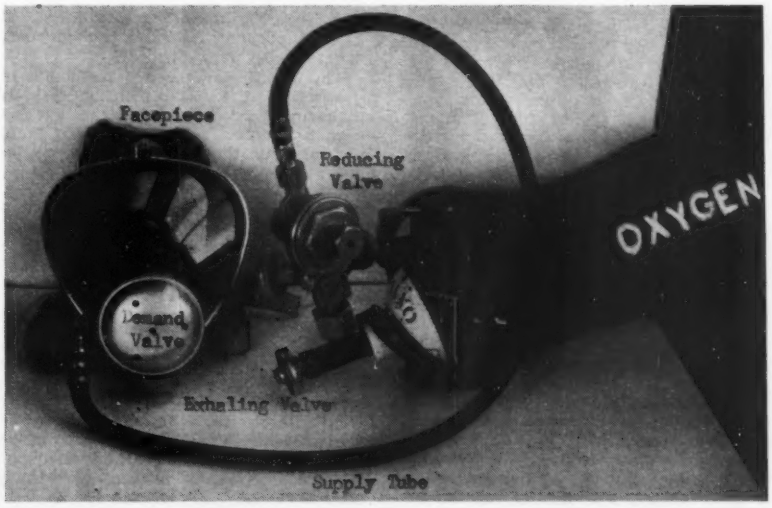
NEW CONVEYOR LOADER

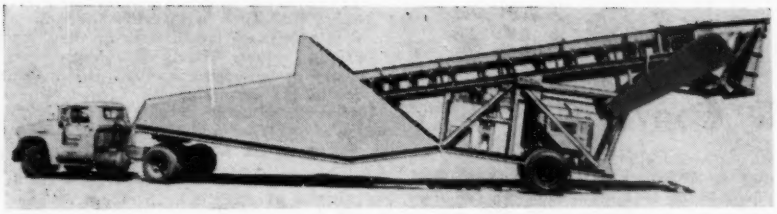
The Roughloader, a heavy duty conveyor loader designed for bulldozer push charging in shallow cuts has been introduced by Koehring Co. of California (Ko-Cal), a division of Koehring Co. Milwaukee. This new loader is available in three sizes : 42, 48, and 60 in. belt conveyor widths.

The Roughloader has been thoroughly proved in the field, indeed, a 48 in. Roughloader was clocked loading out 30 yds. of material in 30 sec.

The charging end of the Roughloader has a low profile which makes it ideal for shallow cuts. This end is strong enough to support both the dozer and the material it is dozing. Heavy duty troughing and impact carriers are closely spaced to handle the heaviest materials, including boulders and compacted clayey chunks. Power is applied to both sides of the head roll eliminating shaft and roll breakdown. The snub pulley is spring loaded to assure maximum belt tension at all times. Operator station at the discharging end of conveyor commands full view of vehicles being loaded.

The Dyer resuscitating apparatus





The Koehring Roughloader

Transporting the Roughloader between jobs can be accomplished easily as a built-in pin-type connection adapts to most standard tractors. Moderate speeds over highways can be attained with the arrangement.

CHEMICAL PUMP IN SILICON IRON

The new 2 in.-2½ in. Hypersilid chemical pump recently produced by Lee, Howl and Co. Ltd., has an unusually wide range of applications in many process industries owing to its advanced design and corrosion resistant properties.

The pump is made from silicon iron castings manufactured by Bradley and Foster Ltd., and is suitable for the chemical and petro-chemical industries as well as for installation in trade effluent treatment plants in industry generally. It is designed for the handling of such corrosive liquors as sulphuric acid at any temperature or concentration, nitric, acetic, formic, phosphoric acids and many others. The outputs are: 153 ft. head—75 g.p.m. maximum; 80 ft. head—187 g.p.m. with maximum impeller dia.; 86 ft. head—65 g.p.m. maximum; 51 ft. head—150 g.p.m. with minimum impeller dia. The speed is 2,900 r.p.m.

No wear rings are fitted, the impeller running clearance being generous, thereby avoiding rapid loss in pumping efficiency from wear and corrosion. The various parts in contact with the acid are made of silicon iron, while other parts are of best quality fine grain grey iron castings. The pump shaft is made of Staybrite steel and is adequately protected against liquid drippings by a high silicon iron wearing sleeve extending through the whole depth of the stuffing box.

The impeller and shaft assembly can be quickly removed as a unit through the pump casing, without disturbing any of the bearings and other components. Two widely spaced ball and roller bearings are fitted in the substantial cast iron headstock. The casing is of the volute type, made from high silicon iron, of ample wall thickness to allow for design pressure under corrosive conditions and is provided with a drain plug.

BRITISH EQUIPMENT FOR NORWAY

Rectifier equipment for extensions to the aluminium smelting plant owned by Ardal og Sunndal Verk in Norway is in its final stages of manufacture in the Rugby Works of Associated Electrical Industries Ltd. Most of the equipment has been dispatched and erection at site, which is being supervised by AEI engineers, started early in March and is going well.

The contract for this equipment, which is rated 108,000 kW. and is believed to be the largest of its kind in the world, was obtained towards the end of 1959 by AEI Heavy Plant Division in the face of severe competition from the Continent. A/S Ardal og Sunndal Verk are already the largest producers of aluminium in Norway and the new extensions—situated at Ardal at the head of the Sognefjord on the west coast—represent an increase in production capacity of 32,000 t.p.y. The plant is to be in commercial operation in the autumn this year.

The semiconductor rectifier equipment now being completed at Rugby is rated at 135,000 amp., 800 volts, direct current. AEI germanium rectifiers were selected on the technical merits of the equipment and on the successful operating experience already obtained in service with AEI equipment. The development of semiconductor power rectifiers was pioneered in Great Britain by AEI, the first equipment being put into commercial service in 1953. Since then many important equipments have been installed and are now successfully operating in various countries throughout the world.

The transformers required to operate with the rectifier equipment for Ardal are being manufactured in Norway by A/S Rich Pfeiffer, with whom AEI have collaborated in the overall design of the installation.

CALCULATING ROCK-BOLT REQUIREMENTS

New procedures for calculating rock-bolt spacing to promote safe maintenance of mine roof have been developed by the U.S. Bureau of Mines.

According to an illustrated Bureau report, the development resulted from a co-operative study of roof-support problems in a Michigan copper mine. Although evolved to meet the problems of that particular mine, the method is said to be applicable "for most bolted roofs and for most mines".

The first step of the new method is to overbolt, that is, install many more bolts than are needed as rooms of varying span are mined. After each such room is mined out, the bolts are selectively removed, individually or in groups, by blasting the nuts off the bolts. Sag, strain, and bolt load are measured from outside the room, between removals. Computations based on these measurements show the spacing of rock bolts in relation to optimum roof span for any reasonable factor of safety.

Details of the method and mathematical and mechanical aspects of its application are given in Bureau of Mines Report of Investigations 5746, *Determining the In-Place Support of Mine Roof With Rock Bolts, White Pine Copper Mine, Michigan.* A copy can be obtained from the Publications-Distribution Section, U.S. Bureau of Mines, 4800 Forbes Ave., Pittsburgh 13, Pa. U.S.

DRILLING INCLINED HOLES

A growing trend towards the use of inclined rather than vertical holes in open pit operations has been noted in our weekly issue and in *The Mining Journal Annual Review* during recent years. Interest was quickened in 1960 by the introduction by Joy of a large hole drill designed for inclined holes and by a paper by B. J. Kochanowsky given at the 10th annual drilling and blasting symposium at the Colorado School of Mines. (See also *The Mining Journal*, March 3, 1961.)

According to Kochanowsky, holes in limestone and dolomite quarries drilled upwards at an angle of 45 deg. have given powder factors as high as 15 to 17.5 tons per lb. of explosive. The reasons why better blasting efficiency can be anticipated with inclined holes are:

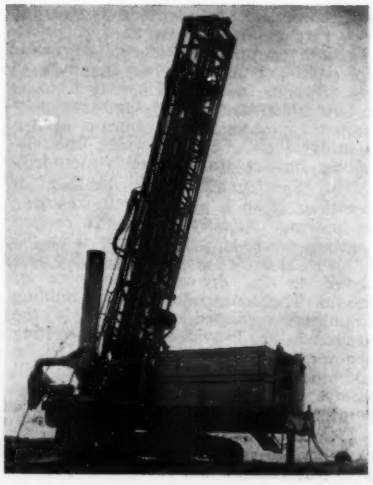
(1) The percentage of total explosive energy available for fragmentation is much higher;
(2) Toe resistance is much smaller;
(3) A larger percentage of total hole volume can be used to contain explosives.

Preliminary tests in the laboratory together with large scale field trials, so it is claimed, have indicated that, for each 1 deg. of inclination off vertical, a saving in drilling or explosive costs of about 1 per cent may be expected (presumably for small inclinations).

Inclined holes, so it is stated, show up to best advantage on high banks where vertical holes often give rise to excessive back break and unsafe brows. Inclined bank faces are inherently more stable and drilling machines may be manoeuvred on the brows with increased safety.

Machines capable of drilling inclined holes up to 5½ in. dia. have been available for some time and larger machines are now appearing. Joy have announced the introduction of a new angle hole drill—the 965-BH Champion. This machine is able to drill a 10¾ in. dia. hole at any angle from vertical to 30 deg. off vertical and to a depth of 150 ft. All controls are push-button operated by one man from a pressurized cab which can be air-conditioned and heated if required. The air compressor and hydraulic pump are also housed in a pressurized, dust proof machinery cab, power being either electrical or diesel, as required.

The 965-BH Champion drill by Joy Manufacturing Co.



Metals and Minerals

Expansion of Aluminium Capacity in Britain and Europe

As reported in this column last week (p. 582), a hot mill about 172 in. wide, which will be the widest aluminium rolling mill in the world, is to be built by British Aluminium, now jointly controlled by Reyonlds Metals and Tube Investments, as part of a £10,000,000 expansion programme at the Falkirk rolling mills in Scotland. This major development marks yet another stage in the battle between the aluminium giants for a growing share in Britain's expanding market.

The consumption of aluminium in the U.K. is rising at a rate of about 6-7 per cent per year. In 1960 dispatches of primary aluminium reached the record total of 353,878 l.tons, which compares with the previous record of 288,955 tons set up in 1959. Shipments of semi-fabricated aluminium products rose last year to 396,521 tons from the previous peak of 354,076 tons in 1959. The greatest increase in any category, however, was recorded for the 1960 shipments of rolled goods, which were reported at 181,942 tons as against 161,576 tons for 1959. The second largest gain was made by extruded bars and sections, shipments of which rose last year to 47,782 tons compared with 37,708 tons for the previous year.

These figures point to an appreciable rise in Britain's *per capita* consumption which, according to the Bureau of Mines, U.S. Department of the Interior, was in the region of 14.5 lb. per person in 1959, having increased by more than 4 lb. since 1953.

The new mill will bring British Aluminium's total capacity in the U.K. to well over 200,000 tons. The second largest U.K. manufacturer, Alcan Industries (a member of the Alcan group) has a capacity of some 130,000 tons of wrought products per year. Its most spectacular development is a £10,000,000 project at Rogerstone, near Newport, where a 144 in. wide, 4-high rolling mill was officially inaugurated in October last year. Another important project is the new rolling mill which James Booth Aluminium Ltd. is installing at Kitts Green, Birmingham, and this is expected to come into production during the coming year. This company is jointly owned by Kaiser and Delta Metal. In June, 1959, Alcoa teamed up with Imperial Chemical Industries to form the Imperial Aluminium Co. (Impalco). The latter company's interests have since been extended, e.g., by acquiring control of Almin, the parent company of Associated Light Metal Industries, but its manufacturing capacity is still relatively small.

Across the Channel expansion also proceeds apace and future prospects have been described as "brilliant". M. A. Dumas, general manager of Aluminium Francais, estimates that in the Common Market consumption, which rose from 157,000 to about 700,000 tonnes in the past ten years, will reach 1,400,000 tonnes in 1970.

The increase in the production capacity of aluminium in Europe, which was 110,000 tons in 1960, will be higher in 1961 at about 125,000 tons, according to the Organization for European Economic Co-operation (OEEC). Of this year's increase, OEEC states, about 60,000 tons will be in Norway (Ardal Works), 40,000 tons in France (Lannemezan and Nogueres), 15,000 tons in Spain and 10,000 tons in Germany.

In France, at Nogueres—Lacq area—the third series of 120 electrolytic furnaces will start operating in July, 1961, and in Lannemezan, capacity will be increased after June, 1961, by another 3,000 tons per year. In Germany, the construction of the electrolytic plant with a planned capacity of 30,000 tons in 1963 has been under way since the end of 1960.

Péchiney has started baking the carbon lining of the new potlines at the aluminium plant in Nogueres, France, which will add another 30,000 tons a year to their aluminium output, which totalled 187,000 tons in 1960. The Noguères plant will be able to produce more than 90,000 tons of aluminium annually.

Increases in capacity of processing industries have been recorded in almost every European country. Two new works were installed in the Netherlands.

Smelter and refinery production continued to rise in the second half of 1960 for aluminium. An increase, at least as great as the previous year, shared by the main producers, will take place for aluminium and production might well reach in 1961, 950,000 tons compared with 835,000 tons in 1960.

*

The new aluminium plant to be built in Italy by the Montecatini Co. will have a capacity of 100,000 tons of aluminium per annum, according to a statement by Dr. Carlo Faina, chairman and managing director. The original announcement that the company was planning to build a new aluminium plant was made last year, but no details were available at the time.

Dr. Faina said the envisaged capacity of the plant was 20,000 tons higher than Italy's present annual aluminium output. He said the plant would be located in one of Italy's underdeveloped areas, probably Sardinia.

Montecatini has concluded an agreement with the Madras Aluminium Company Ltd. to build a plant in the State of Madras, India, for the annual production of 10,000 tons of aluminium ingots and aluminium alloys. Montecatini will provide technical assistance in the building of the plant and will help to run it. The Madras Aluminium Company was formed by Montecatini, the Indian government and private groups.

*

A/S Norsk Aluminium Co., a subsidiary of Aluminium Ltd. of Canada, is to expand annual output capacity at its works in Hoyanger, West Norway, from 13,500 to 26,000 tons of crude aluminium.

The expansion scheme includes the building of a new power station, installation of 100 new smelting furnaces (in addition to the 44 old ones) of 50,000 amps. each, enlargement of the foundry, silos, quay and so on. Preparatory work will start this year, and the scheme is scheduled for completion at the end of 1965. The total cost has been put at 90,000,000 crowns.

The metal will be delivered to Naca's subsidiary, A/S Nordisk Aluminiumindustri, which operates rolling mills and a factory for finished aluminium goods at Holmestrand on the Oslo fiord. An expansion scheme is already well under way at the Holmestrand plant, aimed at doubling annual output capacity from 13,000 to 26,000 tons of aluminium semi-manufactures and finished goods. This scheme will cost an estimated 32,000,000 crowns.

Norsk Hydro, Norway's biggest chemical concern, has applied to the Norwegian government for a concession to exploit the Koldal and Suldal catchment areas in Rogaland country, western Norway. The project would involve building hydro electric power stations with an annual output of some 2,000,000,000 kW. It is believed that Hydro would use the power for aluminium production at a projected factory at Karmoy, western Norway. The power would be sufficient for the production of 100,000 tons of aluminium a year.

*

A £15,000,000 aluminium smelter with an annual capacity of 50,000 tons is expected to be built in Kuwait, and it would be the first major aluminium project in the Middle East, according to reports of an agreement believed to have been signed recently between the Ruler of Kuwait and Reynolds Metals. The smelter would produce aluminium from imported alumina, using power based on Kuwait's natural gas which is at present going to waste. The low power costs should offset the high price of imported alumina which would probably be shipped from West Africa or North America.

It is reported that Reynolds Metals is considering building an aluminium plant, at a cost of £8,900,000 in Turkey, using bauxite supplied initially from Africa. The Catalagzi and Hirfanli power stations could supply power for production.

*

Kaiser Aluminum and Chemical Corporation is to re-open two more potlines at Chalmette, La., and a further two potlines at its Mead, Washington, plant. This will bring the company's overall aluminium production to nearly 82 per cent of capacity compared with the recent 65 per cent level. Three other potlines have been re-opened during the past four or five weeks. The reason for the re-openings, say the company, is "a continuing rise in aluminium sales".

*

Canadian British Aluminium has turned the corner. Mr. Megill, executive vice-president of the company told Toronto security analysts that the company expects to show a profit for the current financial year ending next July 31. In the last financial year the company showed a consolidated net loss of $1,439,000.

*

Scheduled for operations this year, the Taiwan Aluminium Corporation's plant extension at Kaohsiung, in southern Taiwan, is expected to increase output from 8,000 to 20,000 tonnes of ingots a

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year. When completed this plant will be among the most efficient producers in the world. Its expansion is being financed by the Development Loan Fund, Washington, D.C. As part of the expansion programme Westinghouse Electric are to supply what is claimed to be the world's largest silicon rectifier installation to provide 41,600 kW. of d.c. power. The Taiwan Aluminium Corporation is an integrated undertaking which produces a wide variety of fabricated products.

★

The Yawata Iron and Steel Co., Japan's largest steel producer, is planning to start aluminium production. A new technique for extracting aluminium, as well as iron, from laterite will be employed. Laterite abounds in the Philippines and other South-east Asian countries. Partnering Yawata in the projected aluminium venture are the Nisso Steel Manufacturing Co. and the Konoshita Sansho Trading Co.

JAPANESE INVESTIGATE RHODESIAN NICKEL

A second and more detailed examination of the Trojan nickel claims near Bindura, Rhodesia, has recently been made by Japanese technicians. The initial investigation was made by Japanese interests two years ago. Not only were nickel deposits investigated during the latest visit but information was gathered about costs and availability of equipment. The Japanese team later held discussions in Johannesburg with the Anglovaal group which holds the option on the Bindura claim.

SHARP INCREASE IN U.S. BISMUTH IMPORTS

World production of bismuth rose slightly last year to 5,200,000 lb. from 5,100,000 lb in 1959. Although consumption of bismuth metal in the U.S. declined by about 4 per cent last year imports increased sharply from 457,163 lb. in 1959 to 1,167,019 lb. last year; metal consumed totalled 1,527,252 lb. against 1,598,047 lb.

In their report for the U.S. Bureau of Mines, Mr. G. R. Gwinn and Miss Edith Hartog state that no purchases were made by the U.S. government for the strategic stockpile, but barter contracts were executed by the Commodity Credit Corporation and about 350,000 lb. of the metal was acquired for the supplementary stockpile. Inventories declined during the year by about 7 per cent, says the report.

Bismuth used in fusible alloys declined slightly, far less was used for experimental work, and there was a very sharp rise in consumption by the pharmaceutical industries.

Production of refined bismuth was almost entirely from metallurgical by-products of lead refining. Bismuth recovered from alloy scrap in 1960 in alloy products increased substantially over the previous year.

★

In the table on page 571 of our last week's issue, rutile exports from the Cameroons were erroneously given as 24,500 tonnes. The correct figure should be 24.5 tonnes.

Copper · Tin · Lead · Zinc

(From Our London Metal Exchange Correspondent)

Developments in the market have been few owing to the Whitsun holidays, but on Tuesday it became apparent that the upward movement in the copper market had not yet expended itself. There were, in addition, indications that a further rise in the U.S. price structure was to be expected as the custom smelters raised their intake price of scrap over the period by 1½ c. per lb., bringing the figure to 27¾ c. per lb. This is equivalent to a copper price of over 33 c. per lb. At the same time it is understood that sales are being made on an average price basis and not at the quoted 31 c. per lb.

All producers now stand at this same quoted level but here, of course, metal for delivery after June is priced at the quotation ruling at the time of shipment. The strength of the copper market has been assisted by a strike at El Teniente and also trouble at the docks in Chile.

The tin market is marking time pending the results of the International Tin Council's conference now being held in London, the last under the old agreement. At this meeting the existing statistical position will have to be studied.

On Thursday the Eastern price was equivalent to £886½ per ton c.i.f. Europe.

The lead and zinc markets have been featureless although the latter appears to have developed a slightly firmer undertone.

Stocks in official warehouses (in tons):

Copper	...	16,467,	increase 400.
Tin	...	9,190,	decrease 144.
Lead	...	11,779,	decrease 100.
Zinc	...	6,968,	increase 390.

Official turnovers (in l.tons) for the week ending May 19, with the previous week's figures in parentheses, are :

Copper	...	18,825	(18,425)
Tin	...	1,215	(2,480)
Lead	...	8,100	(8,975)
Zinc	...	7,250	(6,700)

Closing prices (for four days) were as follows :

	May 18		May 25	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£244½	£244¾	£247	£247½
Three months	£245½	£245¾	£248¼	£248½
Settlement	£244¾		£247½	
LEAD				
Current ½ month	£66½	£66¾	£65½	£65¾
Three months	£67¼	£68	£67	£67¼
TIN				
Cash	£868	£869	£869	£870
Three months	£872	£872½	£874½	£875
Settlement	£869		£870	
ZINC				
Current ½ month	£81¾	£81¾	£82½	£82¾
Three months	£82¼	£82½	£82¾	£82¾

LONDON METAL AND ORE PRICES, MAY 25, 1961

METAL PRICES

Aluminium, 99.5%, £186 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £230 per ton
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 11s. 0d. lb.
Cerium (99%) net, £15 0s. lb. delivered U.K.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.
Cobalt, 12s. lb.
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram
Gold, 251s. 0½d.
Iridium, £20/£23 oz. nom.
Lanthanum (98%/99%) 15s. per gram
Magnesium, 2s. 2½d./2s. 3d. lb
Manganese Metal (96%/98%) £275/£285
Nickel, 99.5% (home trade) £600 per ton
Osmium, £18/£22 oz. nom.
Osmiridium, nom.
Palladium, Imported, £8 12s. 6d.
Platinum U.K. and Empire Refined £30 5s
Imported £28/£28½
Quicksilver, £67 ex-warehouse
Rhodium, £43/£45 oz
Ruthenium, £14/£16 oz. nom.
Selenium, 46s. 6d. per lb.
Silver, 79½d. f. oz. spot and 80d. f'd
Tellurium, 37s. 6d. lb

ORES AND OXIDES

Antimony Ore (60%) basis	30s. 0d./35s. 0d per unit c.i.f.
Beryl (min. 10 per cent BeO)	270s./275s. per l. ton unit BeO
Bismuth	30% 5s. 0d. lb c.i.f.
	20% 3s. 3d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semifriable 48%) (Ratio 3 : 1)	£15 5s. 0d. per ton c.i.f.
Hard Lumpy 45% (Ratio 3 : 1)	£15 10s. 0d. per ton c.i.f.
Refractory 40%	£11 0s. 0d per ton c.i.f.
Smalls 44% (Ratio 3 : 1)	£13 5s. 0d. per ton c.i.f.
Baluchistan 48% (Ratio 3 : 1)	£11 15s. 0d. per ton f.o.b.
Columbite, Nigerian quality, basis 70% combined pentoxides (Ratio 10 : 1) Nb_2O_5 : Ta_2O_5	165s./167s. 6d. per l. ton unit c.i.f
Fluorspar—	
Acid Grade, Flotated Material	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF_2)	156s. 0d. ex. works
Lithium Ore—	
Petalite min. 3½% Li_2O	50s. 0d./55s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O	50s. 0d./55s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O	75s./85s. per ton f.o.b. Beira
Magnesite, ground calcined	£28 0s./£30 0s. d/d
Magnesite Raw (ground)	£21 0s./£23 0s. d/d
Manganese Ore Indian—	
Europe (46%-48%) basis 60s. 0d. freight	73d./75d. c i.f. nom.
Manganese Ore (43%-45%)	69d./71d. c.i.f. nom.
Manganese Ore (38%-40%)	nom.
Molybdenite (85%) basis	8s. 11d. per lb. (f.o.b.)
Titanium Ore—	
Rutile 95/97% TiO_2 (prompt delivery)	£24½ per ton c.i.f. Aust'n
Ilmenite 50/52% TiO_2	£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)	119s. 0d./124s. 0d. per unit c.i.f.
Vanadium—	
Fused oxide 95% V_2O_5	7s. 6d./8s. per lb. V_2O_5 c.i.f.
Zircon Sand (Australian) 65-66% ZrO_2	£16 ton c.i.f

Mining Finance

Anglo American's Investments Fall

There are seventy-six pages to the 1960 annual report of Anglo American Corporation of South Africa. They contain a wealth of information about the group's widespread activities. Despite this it is to the annual statement by the chairman, Mr. Harry Oppenheimer, that shareholders principally look for guidance. This is due to come along after May 31 when South Africa actually becomes a republic and this year it will more than ever be eagerly read for the light that Mr. Oppenheimer may be able to throw on the stormy African political situation.

It was African politics that hit the mining markets so hard last year. As a result, as shown by the preliminary figures discussed here on March 31, Anglo American had the sharp contrast last year of buoyant revenue and a substantial fall in the market value of its quoted investments. The report now shows that whereas the aggregate book value of quoted investments held by the corporation and its subsidiary and associated companies increased from £129,124,187 to £131,314,337 during the year the market value fell by as much as £98,495,571 to £314,411,458 by the end of 1960 and must have inevitably suffered further denudation since. Mr. Oppenheimer will no doubt have more to say about this in his speech.

It is interesting to note that Anglo did not fail to support the market at times last year. The directors say that the low market prices of many shares presented a number of opportunities to acquire sound investments at favourable prices which the corporation and its subsidiaries did on a substantial scale. Another interesting point is that the demand for loans by associated companies was somewhat less because these concerns found themselves in a position of relatively high liquidity.

The report does not enter on any discussion of the outlook for Anglo American—this is left to Mr. Oppenheimer—but it seems on present indications that there may be some diminution in dividend income in 1961 with the copper mines not doing so well, the finance companies possibly conserving resources for capital ventures that are now difficult to finance externally and the dividend boom by the new gold mines losing its edge. There may also have to be some further writing down of investments—in fact there will certainly have to be unless the share market stages a very substantial recovery. Intrinsically there is no doubt that such a recovery is warranted, but there will have to be a great political turn-round in Africa if it is to be free to take place unless some other factor comes into being such as a devaluation of the Rand which could just conceivably be somewhere on the horizon.

In the meantime, Anglo American stand at 123s. 9d. to yield 7.3 per cent, a return well above the normal average for this stock representing as it does a group of such great financial strength and diversity of interests. And so far, despite politics and racial strife, Africa's big mining enterprises continue smoothly on their highly profitable way.

ANGLO TRUST BUYS MORE DE BEERS

Anglo American Investment Trust, the Anglo American Corporation group's diamond shareholding company, stepped up its net profit from £3,407,976 to £3,804,787 in 1960. This reflected an increase of nearly £500,000 in investment income, an increase caused by the full reflection for the first time of the higher De Beers dividend rate of 12s. 6d., an expansion in its holdings of both De Beers and the Diamond Corporation, and a larger distribution by the Diamond Purchasing and Trading Company.

The expansion of the De Beers holding is stated by the chairman, Mr. Harry Oppenheimer, to have come about by the purchase of 117,932 Deferred shares in the market bringing the number of shares held up to a round 3,500,000 or 20.55 per cent of those in issue. The rise of 303,571 shares to 3,928,571 in the Diamond Corporation holding arose out of a rights issue by this concern which handles some 80 per cent of the world trade in rough diamonds. Anglo Trust now has a 17.9 per cent direct stake in the Diamond Corporation.

As already announced at the end of January, the Trust has stepped up its

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MAP OF THE GOLD MINES OF THE KINROSS AREA

Copies of this map, prepared by *The Technical Map Service* of Johannesburg, are now available in London. They show (as at November 1959):-

- the exact position of each mine on the field.
- where on each property boreholes have been sunk, and what has been the core recovery on reef intersection.
- what shafts are being sunk.

Accompanying this map is a small outline map, bringing the borehole results up-to-date as at October 1960.

★While a mine is at the development stage, it is of vital importance to have a visual picture of its position in relation to the field as a whole. Otherwise the quarterly results published by the companies lose much of their significance.

★Results reported from adjacent mines often have a direct bearing on the one in which you are interested, which, however, can only become apparent if you have clearly in mind the position of the properties in relation to one another.

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dividend for 1960 by 2s. 6d. to 20s. and there is again a bonus of 5s. This distribution takes £3,125,000 so once more £500,000 is put to general reserve, which now stands at £7,250,000, leaving the carry forward some £30,000 higher at £512,058.

Anglo Trust's quoted shareholdings standing in the books at £4,753,611 had a market value on December 31 of £28,218,750. This will have been represented entirely by the holding in De Beers Deferred which have since fallen from 156s. 3d. to 113s. 9d., a drop of 27 per cent, which would bring the current market value down to around £20,000,000 and the net asset value to about £10 per £1 Ordinary share presently quoted at £9 5s to yield 13.5 per cent before allowing for double tax relief. This is a better return than that given by De Beers itself. It looks more than probable that one of these days Anglo Trust may make a major capitalization issue. The last one was in 1955 and consisted of one Preference share for every Ordinary share held.

As regards the current year's Ordinary dividends, Mr. Oppenheimer says that in view of the pronounced discrepancy between interim and final (last year's interim was 7s. 6d.), consideration will be given when the time for deciding the 1961 interim comes along next month to reducing this differential.

KILLINGHALL STRIKES BAD PATCH

The fluctuations of fortune that can be experienced by a single-dredge tin producer are typified by Killinghall Tin and are underlined in Mr. Jack Addinsell's annual statement. In the year to last September the mine produced 364 tons of tin ore but sold 423¼ tons by drawing on stocks. This left 65 tons unsold at the end of the year and this was disposed of in the first (December) quarter of 1960-61 when total sales were 112 tons. In the following three months the dredge ran into poor ground with "particularly tough digging conditions", which adversely affected the yardage treated. As a result there was a sharp drop in sales during this period to only 48¼ tons. (See page 615.)

Recently, Mr Addinsell says there has been some slight improvement in the rate of output, but he nevertheless concludes that dividend prospects for the current financial year are "not encouraging". The chairman emphasizes that such periods of poor returns must be expected from time to time on this Malayan property owing to the depth of the ore-bearing ground and the variations in its occurrence.

For 1959-60 Killinghall paid 25 per cent on the 5s. units, the same as for the previous year, but the distribution was not fully covered by earnings. The units, thanks probably to the strength of tin shares generally, keep up well at 21s. 6d. to yield 5.8 per cent. They look amply valued at this level in view of the chairman's dividend caution.

HONGKONG'S SALES RISE SHARPLY

Mr. Addinsell was able to be more optimistic about Killinghall's sister company, Hongkong Tin, the sales quotas of which were being produced by other concerns in the Osborne and Chappel group up to last September when Hongkong's own dredge re-started operations. Only 48¼ tons were produced in the December quarter, but ore sales in the March quarter jumped to 172 tons. Here again there are the risks attaching to a single-dredge concern, but the chairman considers that the dredge, currently working to full capacity, should maintain a satisfactory average rate of production during the remainder of the current financial year to next September.

The company is considering the establishment of an open-cast operation in the northern part of its property, a scheme that is currently under investigation. For 1959-60 Hongkong paid 15 per cent on the 5s. units, a distribution just covered by earnings. The yield at 23s. is only 3.3 per cent, the units having been a strong Far Eastern favourite in recent weeks. The dividend outlook for 1960-61 is obviously quite good, but it has to be remembered that the dredging life, to quote Mr. Addinsell, is "limited" so that, from an investment viewpoint, much is going to depend on the open-cast proposition and, of course, on its cost.

GOOD PROSPECTS FOR PENGKALEN

Pengkalen, yet another single-dredge Malayan tin producer, is doing well after the disruption to its operations in the year to last September caused by the close-down of the dredge for replating and renewal of the bucket band. The dredge is now in an excellent state of repair, the chairman, Mr. W. E. Hosking, says, and in the first half of the current financial year the quarterly returns showed that ore sales had already totalled 306 tons against 391½ tons for the whole of the preceding year. The prospects for 1960-61 are thus "very encouraging". The life of the property appears to be about twelve years, the chairman adds.

For 1959-60 Pengkalen paid 1s. per 2s. share and took the opportunity to write off £90,233 expenditure on the dredge renovation. For the current year the first two of three interims have totalled 9d., double the distribution at this stage last year. It looks as though Pengkalen can now be valued on a dividend basis of at least 1s. 6d. They stand at 16s. 3d. (See page 615.)

WESTERN SELECTION TO INVEST IN U.K.

As anticipated, the Western Selection annual report confirms that the Board headed by Mr. C. J. Burns is not going to use the money received from the Ghana government for the group's four gold mines for further mining adventurings abroad. Instead it is intended to concentrate on investment within the United Kingdom and, should favourable opportunities arise, direct interests will be taken in suitable industrial and commercial undertakings. Prospecting expenditure on the mining properties already held in Canada will be confined to essentials, it is stated. The money in hand for re-investment after the proposed return of 1s. per 5s. stock unit will be approximately £450,000. One question, posed here last week when discussing the preliminary figures, is answered, namely that, although dividends will obviously no longer accrue from the Ghana investments in the year to next September, the profits to date "give reason to anticipate that the current rate of dividend can be maintained". This has to be read in the light of Mr. Burns' statement that quoted investments ex-Ghana have a market value in excess of £450,000 thanks to the policy over the last few years of gradually strengthening the portfolio by investments outside Ghana. At 4s. 10½d. cum the capital return and the 1959-60 dividend of 8 per cent Western Selection yield just on 11 p.c.

COQUILHATVILLE AND THE KATANGA MINES

The Congo Congress committee meeting in Coquilhatville has recommended that mining revenue should accrue to individual states rather than the proposed confederation. This is not an unusual arrangement and still leaves the confederal government free to impose taxes on the individual states, but it is obviously a gesture of goodwill to the Katanga and as such has had the effect of improving the share values of the Katanga mines on the Brussels Bourse. The day the news was announced Union Minière rose from Frs. 1,588 to Frs. 1,650 per tenth of a share and Geomines from Frs. 310 to Frs. 341.

It is obviously the hope of the Congress committee that this gesture might dissuade the Katanga government from its intention to secede from the Congo, but as yet there are still a number of questions unanswered and it is unlikely that the Katanga government will be pursuaded into any hasty action. The main question which does not appear to have been clarified concerns the eventual ownership of the big shareholdings which become available when the Katanga special committee is liquidated. Both the Katanga and the Leopoldville governments have made claims for these shares on the basis of their various sovereignty rights and, as these shares are worth well over £20,000,000 even at today's deflated values, it is obvious that this question must be settled before any policy statements are likely to be made from Elisabethville. (The value of those shares two years ago was over £40,000,000.)

STILFONTEIN COSTS RISE FURTHER

The working revenue at Stilfontein is up by over 6 per cent and yet the increase in working costs has also risen to the extent that the overall working profit has actually fallen by £120,000. In his statement to shareholders the chairman, Mr. J. Scott, has blamed this year's increase in working costs of 2s. 6d. per ton milled on the additional water which the mine is now having to handle, and on the stoping operations in the low grade zone, which is now known to be only limited in extent. However, this is surely not the whole story. Low grade working is bound to affect the cost per oz. and the total cost for a given gold production, but it should not have seriously affected the cost per ton. Equally the additional cost brought about by the water problem has surely at this stage been largely a capital cost incurred in installing additional pumping facilities. It is unfortunate that the General Mining group does not give an itemized breakdown of its cost, but taking the industry as a whole the pumping charges are normally in the order of 2s. 6d. per ton and thus even an in-

crease of 50 per cent does not account for the rise in costs of almost 8s. over the past two years.

Full scale shaft sinking at the Scott shaft is to start about the middle of this year and it is anticipated that expenditure on this project will continue on a substantial scale until early 1964. During the current year capital expenditure on this and other projects will amount to approximately £2,500,000, of which £500,000 will be financed through long-term housing loans. It should be possible to finance the remaining £2,000,000 from profits without reducing the current dividend.

Stilfontein has disposed of its uranium quota rights to Buffelsfontein and whilst the royalties from this source will add little to the income up until 1965 they should give rise to a significant increase between 1965 and 1970.

GENERAL MINING'S PROFITS IMPROVE

Mainly as a result of an increase in dividends and interest on investments the consolidated net profit for the year ended December 31, 1960, has increased from £1,928,824 to £2,031,628. In general this reflects the increase in profit earned by the industry as a whole.

Unfortunately, however, due entirely to political factors, the share values have not appreciated in a similar way. In fact, the market value of General Mining's quoted investments had fallen at the time of the balance sheet from £30,071,200 in 1959 to £23,282,751. The book value of these investments has been increased by £647,635 following the rights taken up during the past year in Western Deep Levels and in Zandpan. Due to the low value at which the investments were standing in the books it has not been found necessary to write down the book value of the investments further, but £350,000 has been transferred to the investment reserve which now stands at £1,350,000. By April 28, 1961, the market value of the investments had fallen to £17,625,098.

SELECTION TRUST EARNS MORE

With two of American Metal Climax's higher quarterly dividends of 35 cents, coming into the accounts, against the previously long-held rate of 30 cents, it was expected that Selection Trust would do better in its year to March 31 last, but although the net profit is up from £1,777,382 to £1,886,584 the dividend is held at 7s. per 10s. unit with a final of 4s. The distribution takes £1,112,972 and reserves get £652,500 leaving £963,639 to go forward.

In the current financial year there should be the benefit of four Amax dividends at the higher rate plus a 28 per cent increase in income from the 36.7 per cent stake in Consolidated African Selection Trust, the interim statement from which was discussed here last week. Selection Trust thus looks to be firmly established on a minimum dividend basis of 7s. to give a yield at 87s. cum dividend of over 8 per cent. The full report is due to be posted on June 6. It is expected to underline the Trust's strong net asset position.

IMPROVED RESULTS ON THE V.C.R.

In his remarks at the Extraordinary General Meeting of Western Deep Levels the chairman, Mr. H. F. Oppenheimer, said that whilst the original intention was to mine about one-third from the V.C.R. and some two-thirds from the Carbon Leader, the recent favourable development on the Contact reef would probably result in a rather higher proportion being drawn from the latter, particularly in the early stages of the mine's life.

Since the end of the March quarter 2,685 ft. have been sampled on the Contact reef, of which 90.9 per cent has proved payable at an average value of 760 in. dwt. Excluding the development done on behalf of the company by West Driefontein, this brings the total footage sampled on the Contact reef from the No. 3 shaft to 6,310 of which 79.9 per cent has proved payable at 758 in. dwt.

As a result of this development some 850,000 tons have been blocked out at an average value of 8.2 dwt. over an estimated stope width of 62 in. This is equivalent to a value of 508.4 in. dwt.

London Market Highlights

The burst of strength in the Kaffir market this week caught London on the wrong foot. News of mass arrests in South Africa in front of the threatened strike of Africans scheduled for next week's official attainment of republican status could hardly be expected to arouse any buying enthusiasm for gold shares. But Johannesburg seemed quite undeterred by the developments, a more potent force in that centre being the persistent, if rather vague, talk of a coming Rand devaluation.

The result was that when the London market resumed on Tuesday of this week it found that the margin between prices in the two centres had widened to as much as 8 per cent in some cases. The gap was thus sufficiently wide to allow arbitrageurs to operate, even though they are now unable to use forward currency dealings to cover themselves against exchange risks that may arise pending receipt here of the payment for stock sold to the Cape.

This had a sharp impact on the market here, which was notably short of shares. London jobbers were accordingly obliged to protect themselves by raising prices nearer to those at the Cape and to widen their dealing margins. The advance in share prices in London was thus out of all proportion to the actual amount of business passing, but there were a few hardy spirits here who were prepared to speculate.

Outstanding in the price movements was a spurt of 7s. 6d. to 113s. 9d. in Western Holdings. Other leading O.F.S. and West Rand counters also showed sizeable gains, President Brand climbing 5s. to 50s., West Driefontein, 6s. 3d. to 77s. 6d. and Vaal Reefs 4s. 4½d. to 36s. 10½d.

The Malayan Tin share group, which had cooled off considerably after its recent boom, also came suddenly to life again. Singapore buyers returned in force on Tuesday with the result that substantial price rises took place in all the leading stocks. Tongkah Harbour, a particular favourite with the East, spurted 15s. to 100s. while Tronoh advanced 5s. 9d. to climb back to their best price of 63s. 6d. Southern Malayan (32s.), Malayan (31s. 9d.), Ayer Hitam (42s. 3d.) and Sungei Besi (42s.) all showed gains of 2s. or so. Beralt improved to 28s. 6d. on hopes that the recent hardening of the wolfram price might herald a sustained recovery.

Copper shares were for the most part marking time despite the continued firmness of the metal price. The rather unexpectedly maintained interim had little effect on Tanganyika Concessions, but the shares later gained a few pence to 23s. 1½d. in sympathy with firmness in Brussels of Union Minière which had followed reports of better relations between Katanga and the Congo Congress. After their persistent decline, Messina were looking a steadier market at around 12s. 9d. but Chartered remained rather uncertain at a low for the year of 57s. 6d.

The Selection Trust results were much in line with expectations; a rise of 3s. 9d. to 86s. 10½d. in the shares stemmed largely from comment on the £5 plus market value of investments held, together with prospects of higher income in the current year from the American Metal Climax interests. Elsewhere, Central Provinces slumped 4s. to 18s. 6d. following news of difficulties with the Indian government regarding the renewal of certain of the company's leases. Gloom induced by political fears also descended upon Ashanti for a while, but after falling 1s. to a new low of 11s. 6d., the shares later rallied to 12s.

THARSIS DOES WELL AGAIN

Tharis Sulphur and Copper, the Glasgow registered producer that operates in Spain, had another good year in 1960 and paid 12½ per cent on the £2 shares for the tenth successive time. At the meeting the chairman, Mr. W. P. Rutherford, again dwelt on the competition in the European market for pyrites from sulphur, which has meant a defence of the pyrites market by successive reductions in price. He hopes that an end to this price war is now in sight and adds that in the long run this would be beneficial to both sides of the trade. (Page 616.)

Mining costs have been contained and the company has a satisfactory looking balance sheet. The Spanish government is improving the port of Huelva by increased dredging. This is favourable news for Tharsis which loaded no less than 187 ships there last year, a number which, Mr. Rutherford hopes, will increase. Tharsis shares stand at around 68s. to yield 7.3 per cent, which is a fair enough return in view of the company's steady dividend record.

RHODESIAN CORPORATION

Although Rhocorp's profit is slightly higher at £85,237 for the year ended September 30, 1960, as compared with the previous year, the chairman Mr. C. J. Burns, has told shareholders that whilst there is sufficient profit available to pay a dividend it would not be in the best interests of the corporation to do so at the present time.

Rhocorp's interests are widely spread covering mining, agriculture, brick-making and real estate and whilst such diversification is normally a good protection for any company this was not the case for Rhocorp during 1960. In the mining field the corporation has been forced

SOUTH CROFTY, LTD.

The fifty-fifth annual general meeting of South Crofty, Ltd., was held on May 18 at Pool, Redruth, Cornwall.

Mr. J. E. Denyer, A.R.S.M., M.I.M.M., Chairman, presided, and the following is an extract from his Statement circulated with the Report and Accounts for the year ended December 31, 1960 :—

During 1960 production of ore was, as forecast, maintained at the same rate, the tonnage treated being 92,680 compared with 92,530 in 1959. Unfortunately the grade of ore fell for a period of several months in the middle of the year; it recovered later and the average for the year was 20.68 lb. of black tin per ton compared with 21.59 lb. in the preceding year. Although the difference is not great it has resulted in a reduction of 36 tons in the amount of black tin produced which was 856 tons in 1960 and 892 tons in 1959. Because of the great variation from place to place in the amount of tin in the lodes at South Crofty fluctuations in the grade of ore mined are inevitable, but there is no reason to suppose that the fall in grade during 1960 indicates a permanent change from the long term average.

Main and subsidiary development totalled 9,498 ft.; the deepening of Cook's shaft was completed and the flotation plant brought into operation with satisfactory results.

The boilers at Robinson's shaft have been equipped with automatic oil-firing equipment, and it has been decided to electrify the steam winding engine at Cook's shaft.

The profit for the year, at £10,063 is lower than that for the preceding year when it was £29,463. Because of the lower grade the net proceeds of tin sales fell by £25,644. The cost per ton milled was 85s. 6d. as against 85s. 9d. in 1959 in spite of an increase in rates and an increase in wage rates.

The report and accounts were adopted.

KILLINGHALL TIN

MR. ADDINSELL'S STATEMENT

The thirty-first annual general meeting of Killinghall Tin, Ltd., was held in London on May 23. The following is from the circulated statement of the Chairman, **Mr. Jack Addinsell :**

At this time last year increasing rates of quota and a better outlook for tin generally gave promise of results better than those of 1958/59. In the event, the mine produced 364 tons of ore during the period reviewed, and by drawing on stock surplus to quota brought forward from the previous year was able to sell 423¼ tons against its quota, plus extra quota acquired from the General Managers' Group Pool and from the Common Surrender Pool. The net mine profit from the sale of tin ore was again affected by the opening and the closing stocks of ore surplus to quota. The 65 tons of ore unsold at the end of the financial year was disposed of during the first and unrestricted quarter of the current financial year, and until or unless quotas are again imposed, the mine will work to full capacity, selling its output in the normal way.

After providing £12,511 for tax, the profit for the year was £17,910, and after bringing in the balance from the previous year and a surplus on realization of Government securities, there was £39,965 for allocation. Your Directors recommend a dividend of 25 per cent, less tax, which will absorb £22,969 net, leaving £16,996 to be carried forward.

Stockholders have been advised of the very disappointing returns during the quarter ended March 31, due to the absence of ore-bearing gravels and the particularly tough digging conditions. Recently there has been some improvement in the rate of output but dividend prospects for the current financial year are not encouraging.

The report was adopted.

PENGKALEN, LTD.

The fifty-third annual general meeting of Pengkalen, Ltd., was held on May 17 at the Registered Office, Station Hill, Redruth.

Major W. E. Hosking, Chairman, presided.

Before proceeding with the business of the meeting the Chairman referred to the recent death of Mr. Stanley Wickett, who had been a director of the Company for forty-four years, and a former Chairman. The meeting stood in silence to express their sympathy and respect.

The Reports and Accounts for the year ended September 30, 1960, having been circulated for the prescribed time, were taken as read, as was also the Chairman's Statement, from which the following is an extract :—

The Accounts for the financial year ended September 30, 1960, show a loss of £25,727 after payment to the Malayan Government of £34,427 for Royalty on Ore Sales, and the writing off of £8,147 for Capital Expenditure. Special Expenditure of £90,233, incurred in Replating the Dredge and the Renewal of the Dredge Bucket Band, has been charged to the Profit and Loss Account and the balance unappropriated at September 30, 1960, was £36,683.

Interim Dividends have already been paid, amounting to 7½d. per share. Your Directors recommend the payment of a Final Dividend of 4½d. per share, which will increase the distribution for the year to 1/- per share absorbing a net amount of £49,000.

As already advised, the dredge was out of commission from early in February to the end of May, during which time the hull was replated, the bucket ladder repaired, a new bucket band installed, and improvements were made to the treatment plant including the installation of hydrocyclones to condition the feed to the jigs. Because of this shut-down period the volume of ground treated during the year was considerably less than normal, and the consequent loss of production, coupled with the cost of the repairs and renewals detailed above, resulted in an increase in mining costs.

A total of 1,217,200 cubic yards of ground was treated for a yield of 295.53 tons of tin ore, with a recovery of 0.55 lb. per cubic yard. The costs per cubic yard were 19.06 pence and the average price received for tin ore sold £482 per ton—compared with £485 per ton in the previous year. Although there was a loss of £25,727 for the year, the actual profit on mining, before charging the cost of dredge renewals and repairs, was £73,578.

I inspected the property during my visit to Malaya in February/March of this year and I was very satisfied with the way in which it is being managed and with the performance of the dredge, which is now in an excellent state of repair. Provided there is no re-imposition of restriction and with a continuation of the present conditions of supply and demand for tin metal, the prospects for the current year are very encouraging. As far as it is possible to estimate at present, the life of the mine appears to be approximately twelve years.

The Report and Accounts were adopted, and the final dividend of 4½d. per share was approved.

MINING FINANCE—*Continued*

to close the Fred and Redwing mine. However, it has a large shareholding in Falcon Mines Ltd., where operations have been progressing very satisfactorily. The agricultural interests suffered owing to the severe and protracted drought experienced in Southern Rhodesia during 1960. It is anticipated that the results for the current year will be much improved, particularly from the tobacco crops.

Another section of Rhocorp's interests which suffered a setback was Rhodesian Brick and Potteries. Due mainly to the virtual cessation of building activity in the Federation this company was unable to declare a dividend in respect of the past year. The company is now altering its products to meet such demand as does exist and recent results show that this policy is meeting with some success.

Meeting June 19, 1961, in London.

TENNANT CREEK DEVELOPMENT

Diamond drilling by Peko Mines N.L. on the Orlando lease at Tennant Creek, Northern Territory, over the past two years, intersected high gold values in four boreholes at about the 400 ft. horizon, which raised considerable hopes in the development of the field at depth. The history of the field has shown the downward persistence of workable gold occurrence to be limited to between 300 ft. and 400 ft., the majority of gold shoots ending above 200 ft. For some time Peko Mines has been driving and crosscutting at and above the 550 ft. level to confirm the drilling results. A test milling of development ore from this work has been put through the government battery. A total of 770 tons of ore was treated for the recovery by amalgamation and strakes of 288.95 oz. of gold of 920.2 fineness, and 33.9 tons of copper concentrates from a small flotation unit, assaying 105.9 dwt. gold and 16.95 per cent copper. Averages from the test were 11.85 dwt. gold and 0.78 per cent copper per ton. Percentage recoveries were gold 74 per cent and copper 73.16 per cent. Results to date are not considered to be conclusive, and that recoveries can be improved in a specially designed plant. Results of the work to date indicate the existence of a shoot of ore extending from the 380 ft. horizon to, and below, the 550 ft. level, estimated to contain 150,000 tons of ore with an average grade of 11 dwt. gold and 1.5 per cent copper.

At the Noble's Nob mine, of Australian Development N.L., noted for its high grade and consistent milling of 2 oz. ore, drilling east of the main orebody between depths of 90 ft. and 110 ft., has located a new make of ore assaying 2 oz. per ton over a width of 15 ft.

THE THARSIS SULPHUR AND COPPER CO., LTD.

IMPROVED TRADING RESULTS

MR. W. P. RUTHERFORD'S REVIEW

The Annual General Meeting of The Tharsis Sulphur and Copper Company, Limited, was held on May 19 at the Registered Office of the Company, 136 West George Street, Glasgow, C.2.

Mr. W. P. Rutherford, Chairman of the Company, who presided, said:—

I propose, if you agree, to take the Report and Accounts posted on April 25, as read.

I shall supplement the Report in the following review.

Shipments

Last year, our shipments of pyrites showed an increase of 71,101 tons over the previous year with a total of 708,884 tons. In a rather dull market, I consider this increase fairly satisfactory. We also shipped from our old heaps at Calañas Mine pyrites residues of high quality as an iron ore, a welcome addition to our revenue.

Markets and Prices

As regards the European market for pyrites, I have spoken of the competition from sulphur on former occasions. I must emphasize that pyrites hardly ranks as a competitor to sulphur although the reverse is certainly the case. Under the onslaught of the internecine sulphur competition, however, pyrites producers have required to defend their market by successive reductions of price. Sulphur, which unlike pyrites has no defence from by-products, has suffered greatly from price reductions, lowering the price to a level very substantially below its former rightful standard. There are signs that this situation is being remedied. It is to be hoped that the upward movement of sulphur prices towards the end of last year, reversing the downward trend for several years past, will continue until the price reaches its proper level. It is not to be expected that works that have left pyrites and expensively converted to sulphur burning will reverse the process. While pyrites was forced to fall in line with the price reductions of sulphur, it cannot follow the upward trend so long as the acid makers continue to replace their pyrites burning plant by the less costly sulphur burning equipment, but an end to the recent price war will be very welcome, and in the long run must be beneficial to both sides of the trade. The demand for sulphur material is fairly active generally. In Spain, the fertilizer season was poor due to climatic conditions, but the Spanish chemical trade is expansionist.

I regret to say that the price of pyrites fixed in Spain remains much too low, and this continued control is unexpected after the financial reforms of 1959, and puts too heavy a burden on the mines.

Mines

It was an uneventful year at our mines. At Tharsis, the principal activity is the removal of overburden in the opencasts. This is performed by diggers loading into dumpers—an efficient method. Interruptions are caused by rainy periods, when the slate, which composes the overburden, is churned into clay by the heavy vehicles. In the drought of summer, the dust is also a handicap but on the whole, the climatic conditions are favourable to opencast working. The earth moving equipment is expensive and a heavy item of expenditure.

In view of the progressive silting of the Port of Huelva, the government placed an order for a dredger in Holland. This was delivered towards the end of last year, and in conjunction with the existing equipment it is expected that the river and bar will be brought up ultimately to the full requirements of a modern port. As we loaded last year 187 ships, and this number will we hope, increase, this is favourable news and should help our chartering.

On the social side, which looms so large in our enterprise, all went smoothly. In conjunction with the neighbouring mines, we have in recent years invited our Buyers to visit our respective mines. We have already received our principal Buyers from Germany, and last year we had visits from our Belgian and French Buyers. These visits have been highly successful in allowing our friends to see "where the pyrites comes from," and the suppliers to make friendly contacts.

Accounts

The net profit of £196,705 is higher this year by £40,818 due to our heavier shipments of pyrites, and particularly to a sharp increase in our production of cupreous mineral. In addition, the shipments of calcined residues were higher by over 50%. Although the sales price of pyrites remained steady throughout the year, there was a fall in the average price due to the reduction in the last quarter of 1959 about which I spoke a year ago. On the other hand, I am pleased to state that we have managed to maintain the mining costs at the same level for the third successive year, but it must be recognized that the greater production was an important factor in this connection. You will have observed that the amount written off Property and Plant has been increased by £26,253 in continuance of the conservative policy of your Directors and in recognition of the ever-increasing cost of new buildings and equipment. We have allocated £100,000 to General Reserve and if the recommended dividend of 12½% is agreed there will be a carry forward to 1961 of £218,138. Turning to the Balance Sheet, it will be observed that our affairs are in a satisfactory liquid position and that the heavy bank overdraft has been extinguished.

General

I desire at this meeting to say a word of praise of the services of our Manager and Staff in Spain, as also our Staff on this side, who have served us so well.

Last year, we suffered the loss of our Auditor, Mr. Hugh Cowan-Douglas, by sudden death. He was a distinguished Accountant with wide industrial interests in the West of Scotland. We extend our sympathy to his widow.

I now propose that the Directors' Report and Statement of Accounts for the year ended December 31, 1960, be and are hereby approved and adopted and that a dividend of 12½% on the capital of the Company be now declared, payable, less Income Tax on and after Friday, May 26, 1961.

The report and accounts were adopted, the retiring directors, Mr. Hugh Hogarth and Mr. Neil Rutherford, were re-elected, and the remuneration of the auditors, Messrs. Brown, Fleming & Murray, C.A., was fixed.

The proceedings terminated with a very cordial vote of thanks to the Chairman, proposed by Mr. Robert Ogilvie.

Mr. Clifford Waite has been appointed a director of London Tin Corporation.

MILL SUPERINTENDENT

Fully qualified experienced metallurgist Copper Sulphide required by Company operating in Cyprus to superintend mill plant copper pyrites ore by selective flotation producing pyrites and copper concentrates. Two year tour three months leave full pay. Passage paid, free housing, medical attention. No educational facilities for children. Applications giving details age, experience, salary required and personal information in strictest confidence to Box 092, c/o Walter Skinner Ltd., 20 Copthall Avenue, London, E.C.2.

GEOLOGIST: Applications are invited from suitably qualified persons for the position of Mine Geologist. Duties include surface and underground mapping, core logging and geological control of development and stoping. Salary commensurate with experience. Apply giving full details of experience, age, marital status, and copy references to Staff Officer, Kilembe Mines, P.O. Kilembe, Uganda, East Africa.

The manufacturers of "Trio" Expanding Roof Bolts at present being used extensively by mines all over the world for safe, reliable, inexpensive roof support, are desirous of extending their exclusive agencies in all overseas, territories. Details from S.A.P.I.M.A. (Pty.) Ltd., 6 Bloomsbury Square, London, W.C.1.

Mining Engineer M.I.M.M. age 54 with 25 years management experience in precious and base metals, underground and opencast seeks senior position overseas or U.K. Willing consider short term commissions. Apply Box 695, *The Mining Journal Ltd.*, 15 Wilson Street, London, E.C.2.

